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VOL. XV.—No. 11.

TORONTO, CANADA, NOVEMBER, 1902

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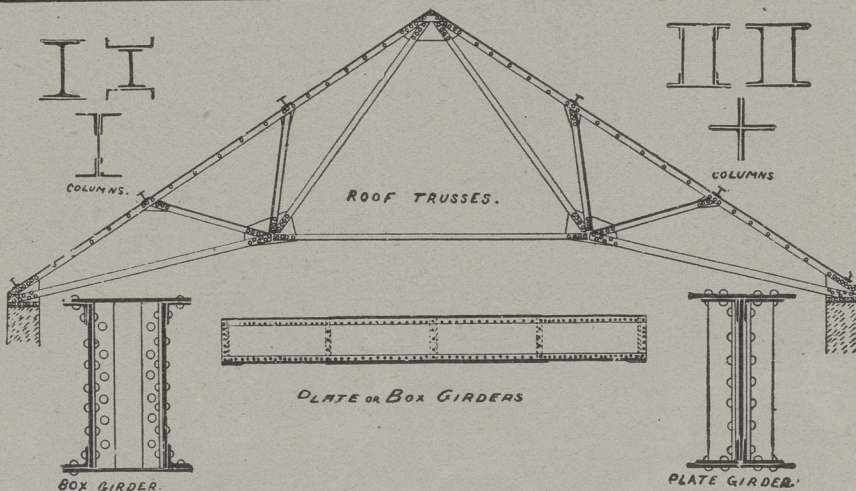
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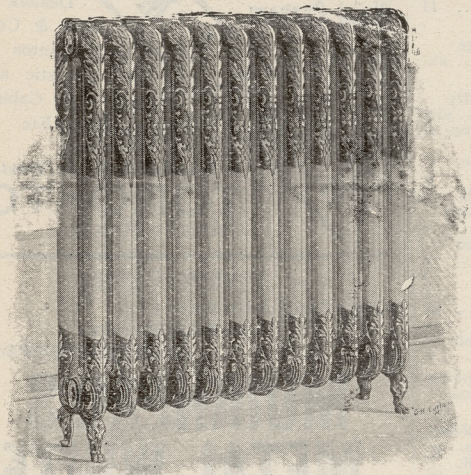
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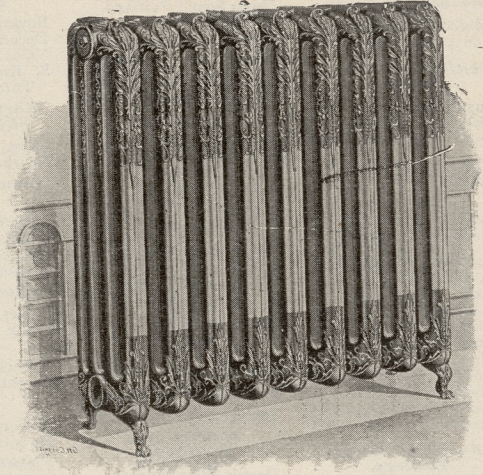
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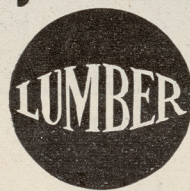
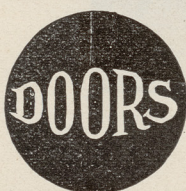
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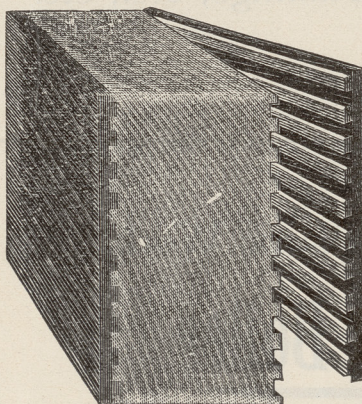
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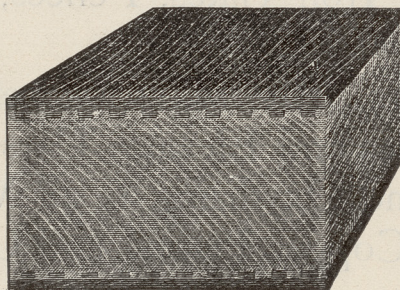
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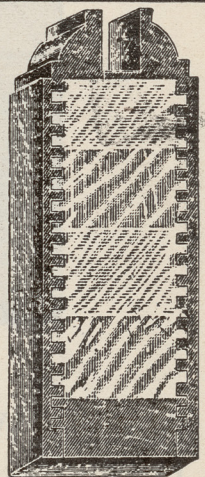
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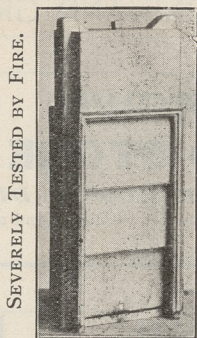
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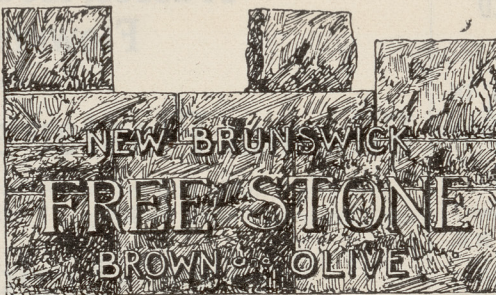
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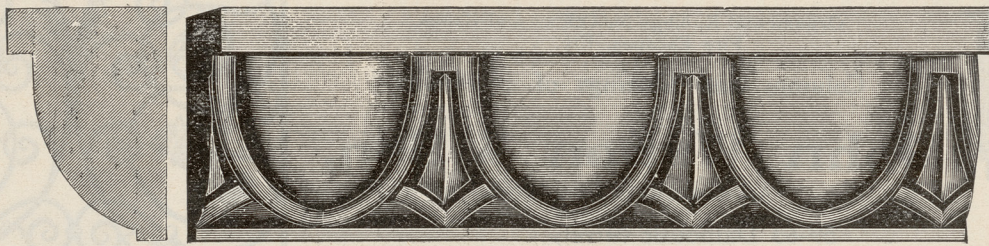
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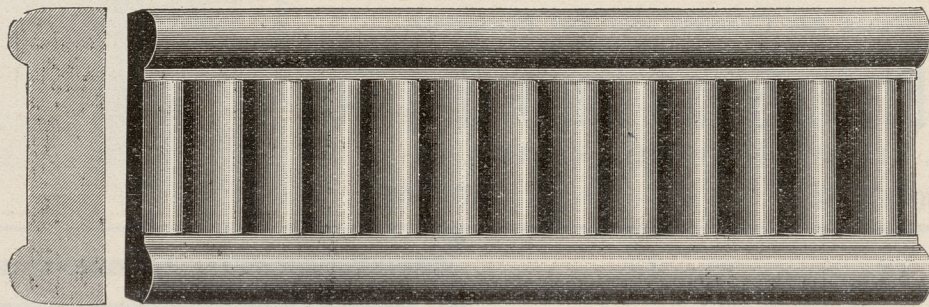
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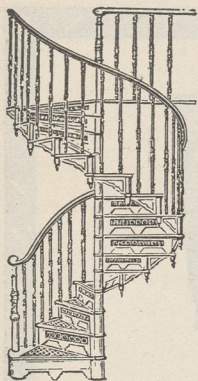
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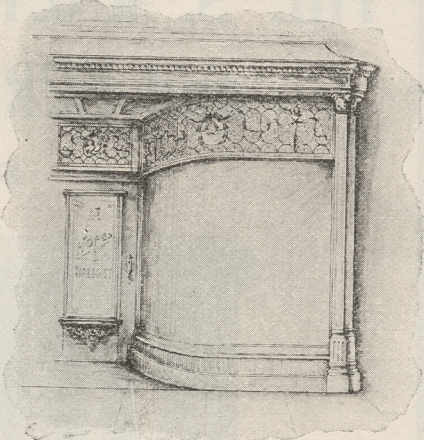
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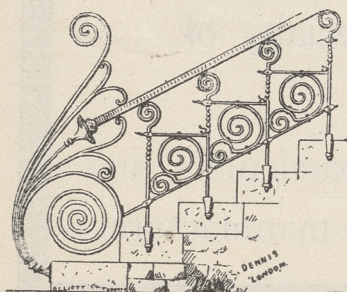
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# The Canadian Architect and Builder

VOL. XV.—No. 179.

NOVEMBER, 1902.

## ILLUSTRATIONS ON SHEETS.

Two Houses in Toronto.—Eden Smith, Architect.  
St. John's Church, Toronto.—Eden Smith, Architect.  
Branch of Dominion Bank, Toronto.—Eden Smith, Architect.

## ADDITIONAL ILLUSTRATIONS IN ARCHITECT'S EDITION.

Photogravure Plate—Merchants' Bank, Winnipeg, Man.—A. T. Taylor, F.R.I.B.A., Architect.  
Photogravure Plate—London & Globe Insurance Company's Building, Montreal.—Hutchison & Wood, Architects.  
New Chemistry and Mining Building, School of Practical Science, Toronto.  
Shop Front, Main Street, Winnipeg, Man.—Sketched by Percy Over.

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## SPECIAL CONTRIBUTORS.

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" S. H. TOWNSEND, " "  
" FREDERICK G. TODD, Landscape Architect, Montreal  
" W. H. ELLIOTT, Toronto.  
" J. C. B. HORWOOD, Architect, Toronto.  
" A. F. DUNLOP, R.C.A., Architect, Montreal.

### Glass as a Fire-Resistant.

A malleable glass is being manufactured at Matthews, Indiana, which is said to be capable of withstanding the greatest possible extremes of heat and cold, including sudden changes from the one to the other. In appearance this glass is said to be much like the ordinary product. It can be made of the thickness of a sheet of paper or as much heavier as desired. The material should prove valuable as ordinary window glass, but especially as a fire-resistant.

### Insanitary Buildings.

It is to be hoped that some definite result may follow the agitation now going on in Toronto to compel the removal of insanitary buildings. York street in that city will serve to illustrate conditions that ought not to be allowed to exist. For years this street, located in the very heart of the business district has been the abode of vice of every kind sheltered in tumble-down buildings, the owners of which reap large returns on their investments and profit largely by the improvements carried out by neighboring property owners. No doubt the local Board of Health has authority to order the removal of buildings which have become dangerous or insanitary. If so, we may hope that the Medical Health officer, who is known to be an energetic official, will now give his attention to the evil.

### A Business Opportunity.

THERE would seem to be an opening in Canada for first-class furniture designer. As a result of the rapid increase of wealth in the last few years, there has come a demand for more costly residences and furnishings, and for specially designed furniture. Large orders for special furnishings have recently been given by Canadian architects to United States firms. Most of the furniture now manufactured in Canada is machine made from stock designs purchased in the United States. As a rule these designs have little or no merit, and are duplicated thousands of times so that they are everywhere in evidence. Persons who have the taste for something better and the means wherewith to buy, should in future have their requirements met by Canadian designers and manufacturers.

### Esprit de Corps.

If the profession of architecture is to be held in public respect and if associations of architects are to accomplish any useful purpose some of the members must be more particular than at present in their methods. Esprit de corps is not promoted by the knowledge that fellow architects have approached your clients and asked to be allowed to submit sketches free of cost, even after your plans have been approved and tenders thereon received. Conduct of this kind is unfortunately in evidence and

is one of the greatest stumbling blocks to the advancement of the profession. There cannot be good-fellowship among architects while petty jealousies and disloyalty prevail. Neither can clients whose attention is drawn to these things be expected to hold the profession in highest esteem.

A Toronto contractor assures us **Profitless Contracts.** that builders in that city are receiving very small profits from their undertakings. The times are prosperous and plenty of building is being done, but it is claimed that the keenness of competition and high prices of labor and materials are proving an off-set, and standing in the way of proper returns to the contractor. There are said to be about two-hundred building contractors in Toronto at the present time, which is far too large a number even in prosperous times like the present. Some of these men are so anxious to get a large amount of work that they tender at ridiculously low figures and thus lower the standard of prices all round. A much wiser course would be for all tenderers to allow in their estimates for a fair margin of profit, and thus assist in securing for builders their share of the results of the prevailing prosperity. If when the times are good little or no profit can be made, the outlook will be gloomy indeed when hard times shall return.

A lecture was recently given by **Smoke as an Explosive.** William McDevitt, Insurance Inspector, before the Fire Insurance Society of Philadelphia, in which the explosive quality of hot smoke was demonstrated. The author explained that in a fire, free carbon rises and mixes with hydrogen; methyl-alcohol, creosote and other gases are also present in smoke. These gases become heated to the point of ignition, and an explosion is the result. Of itself, smoke would explode at a temperature of from 600 to 800 degrees, but frequently the smoke is ignited by sparks or by coming into contact with a flame. Very thick smoke, when ignited, becomes a pillar of flame, and rolls through a room with such force as to shake the walls and make the windows rattle. If sprinkled with water there would be no explosion. Where formerly firemen tried to keep smoke in, under the impression that it smothered the fire, they now immediately break in windows or skylights to let it out. The construction of a central shaft in large stores and other buildings was recommended as one of the best methods of avoiding smoke explosions.

The beauty of the Muskoka Lakes and their value as a health resort have been published far and wide over the continent. As a consequence the number of persons who summer there is steadily increasing year by year. Dr. Bryce, the efficient head of the Provincial Health Department is keenly alive to the necessity of securing the adoption of such sanitary precautions as will maintain as nearly as possible the original purity of the air and water on these lakes. Most of the hotels, including the new Royal Muskoka, are fitted with the septic tank system of sewage disposal described by Dr. Bryce in his admirable paper read before the Ontario Association of Architects last year. Last summer the further step was taken of placing a septic tank on one of the Muskoka Navigation Com-

pany's steamers. The experiment is said to have proved entirely successful, all the sewage from the vessel with the exception of the liquids was consumed by the bacteria in the tank. It is probable that next year all the steamers on these lakes will be provided with septic tanks, thus stopping to a large extent the pollution of the water and greatly reducing the possibility of the spread of disease.

#### C. A. & B. STUDENTS' COMPETITION.

The publishers of the CANADIAN ARCHITECT AND BUILDER invite architectural students in Canada to submit designs in competition for a suburban or town house to cost not more than \$2,500.

The building is to be designed for an inside lot having a frontage of 50 feet, situated on the west side of a street running north and south. The adjoining lots on either side have houses on them 30 feet back from the street line and 10 feet from lot line on either side.

Competitors are required to submit two elevations or a perspective, together with plans of basement, ground, first and attic stories, drawn to  $\frac{1}{8}$  scale in a manner to permit of reproduction within the limits of a double page of the CANADIAN ARCHITECT AND BUILDER, viz., 10x15 inches in size, also details to a larger scale of important or special features of the design. Drawings must be made with PEN and PERFECTLY BLACK INK ON WHITE DRAWING PAPER, OR CARDBOARD. NO BRUSH WORK WILL BE ALLOWED.

Competitors should state the materials proposed to be employed in construction.

Drawings for this competition should be signed with a motto only and be accompanied by a sealed envelope bearing the same motto and enclosing the full name and address of the designer and the name and address of his principals. They should be sent FLAT by post or express, charge prepaid, addressed "CANADIAN ARCHITECT AND BUILDER, Toronto, Canada—Student's Competition," and must reach this office not later than noon on Saturday, January 10th, 1903.

The members of the joint Educational Committee of the Toronto Chapter of the Ontario Association of Architects and the Toronto Architectural Eighteen Club have kindly consented to judge the designs submitted in this competition, and their decision will be final.

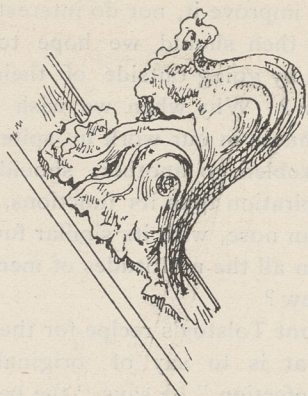
The prizes offered are : First prize, cash \$15.00 ; second prize, cash \$10.00, third prize one year's subscription to the CANADIAN ARCHITECT AND BUILDER ARCHITECTS' EDITION.

The publishers of the CANADIAN ARCHITECT AND BUILDER reserve the right to publish any of the designs submitted and to withhold the prizes if in the judgment of the jury the designs should not be found worthy of the awards.

Intending competitors are requested to read carefully the conditions of competition, and to strictly comply with the same in every particular.

Messrs. Ouellett & Levesque, architects, of Quebec, have registered a partnership.

A brilliant dark green for front gates or doors can be got by first and second coating on old work with two coats of Prussian blue and at least two of verdigris, to be finally finished with good, clear varnish, when the work, if properly done, will last for years, and cannot be successfully matched with any other greens on the market.



SCREEN, NORTH AISLE—AMIENS CATHEDRAL.

## COUNT TOLSTOY ON ART.

Count Leo Tolstoy, in his book entitled "What is Art?" makes a contribution to the question which can hardly fail to affect the progress of art in Europe.

Before making his own definition of art he gives a summary of the views of aestheticians for over 200 years, which must have cost him much labour. It is not easy reading and the conclusion he brings us to is that it is not profitable reading, because the object of the aestheticians is to discover the nature of art by the consideration of examples of all kinds—bad as well as good—and devising a definition of art to cover all these productions. The result of these investigations is a general conclusion on the part of the aestheticians that beauty is the object of art: "that art is that which makes beauty manifest, and beauty is that which pleases." Feeling the instability of this definition of beauty, "many aestheticians have asked themselves why a thing pleases," and "have converted the discussion on beauty into a question concerning taste," and there it squanders. There is no explanation of why a thing pleases one man and displeases another. So that the science of aesthetics fails as a science. "It does not define the qualities and laws of art, or of the beautiful (if that be the content of art), or the nature of taste (if taste decides the question of art and its merit), and then, on the basis of such definitions, acknowledge as art those productions which correspond to these laws and reject those that do not come under them."

Tolstoy quarrels with both the system and its result. He objects to the aim and purpose of art being considered to be the pleasure we get from it, as much as he would object to its being considered that the purpose and aim of food is the pleasure derived when consuming it. He proposes to define art first, and then decide what is and what is not good art by judging whether a work conforms or does not conform to the definition.

"In order to correctly define art," he says, "it is necessary, first of all, to cease to consider it as a means of pleasure, and to consider it as one of the conditions of human life. Viewed in this way we cannot fail to observe that art is one of the means of intercourse between man and man." The peculiarity of this means of intercourse he finds to be that whereas by means of words men transmit their thoughts, by means of art they transmit their feelings.

In order to be a true work of art the feelings transmitted must be the artist's own feelings, which he has lived through either in actual experience or by his imagination. It does not matter what the feelings are, whether they are strong or weak, bad or good: "feel-

ings of love for native land, self-devotion and submission to fate or to God expressed in a drama, raptures of lovers described in a novel, feelings of voluptuousness expressed in a picture, courage expressed in a triumphal march, merriment evoked by a dance, humour evoked by a funny story, the feeling of quietness transmitted by an evening landscape or by a lullaby, or the feeling of admiration evoked by a beautiful arabesque—it is all art."

He therefore makes the following definition:—"Art is a human activity, consisting in this, that one man consciously, by means of certain external signs, hands on to others feelings he has lived through, and that other people are infected by these feelings, and also experience them."

This is art—the definition seems indisputable—but it is not by any means the whole matter of the treatise. The author reaches this definition in 50 pages but there are nearly 200 beyond. He has still to mark off the classes of work which, though they have been usually considered to be art, do not conform to this definition, and to reject the classes of work which, though they do come under the definition and must be called art, cannot be upheld as serving any useful purpose.

The first of these two heads is of the greater immediate interest to architects.

In order the better to distinguish true art from false, Count Tolstoy traces the course of art from the early centuries of Christianity, when renunciation of the world was the motive of life, and art renounced the transmission of feelings of personal enjoyment; through the Middle Ages when, under the inspiration of the church, pious adoration, the fear of hell and the hope of heaven were the themes of good art; to the time of the Renaissance when the rich and powerful, no longer able to believe in Church religion and incapable of accepting true Christian teaching, stranded without any religious conception of life, involuntarily returned to that pagan view of things which places life's meaning in personal enjoyment. It is here he finds not only a great impoverishment of the subject matter of art but the source of the involved, affected and obscure art which has since grown up.

Art does seem at the time of the Renaissance to have fallen into a whirling gulf from which there is no advance, and the change of motive from religious feeling to pleasure would sufficiently account for it; for the satisfaction of pleasure brings merely satiation, while the satisfaction of religious feeling is a renewal of impulse.

In leaving the way of religious feeling and devoting itself to the satisfaction of easily staled enjoyment, art lost the greatness which belongs to it only when it is comprehensible to every one, and became an amusement of the upper classes; in consequence of which, in the pressure of meeting demands for art which did not spring spontaneously in the artists' inner self, artists have had to devise methods of producing imitations of art.

These methods are those of (1) borrowing, (2) imitating, (3) striking (effects), and (4) interesting.

"The first method consists in borrowing whole subjects, or merely separate features, from former works recognized by every one as good works of art and so re-shaping them with sundry additions that they should have an appearance of novelty." This method in its

adaptation to architecture, requires no comment. We are all familiar with it : indeed it seems as if whole fields of work in modern architecture are founded upon this method, and that a great part of modern architecture is a counterfeit art.

The second method (that of imitating) is shown in literature and the drama by dependence upon realism, in music by the attempt to imitate sounds, in painting by the photographic method. In architecture, imitation is too troublesome to be a temptation.

To imitate by architecture structures which are outside the field of architecture requires at least constructive invention. The temptation in architecture is to imitate itself ; to adapt to one branch forms which are only proper in another. It is this which gives us armouries that look like fortresses and which produced Wemmick's castellated cottage.

In the third method (striking) "the effects consist chiefly in contrast;" in bringing extremes together, and producing variations from the ordinary which strike by their unexpectedness. In painting Count Tolstoy describes the "chief and usual effects" to be "effects of light and depiction of the horrible." In architecture it is the creation of the horrible we have to guard against, and perhaps it is best done by applying the old rule for young writers that the part where one is conscious of effect is the part to score out : in other words not to try for effectiveness at all. Architecture consists not in effects but in idea : effects may strike but it is only the idea that infects.

The fourth method—that of interesting, that is too say of absorbing the mind with matter connected with the work—is the most plausible of all the counterfeits of art, for the interest does reside in the work and it is easy to mistake the excitement of interest for the transmission of feeling ; but as a matter of fact the occupation of the mind in this way rather hinders than assists artistic impression—or, to use a word which expresses Count Tolstoy's doctrine better, artistic infection. It is in this way that—to take an example from architecture—those residences which have a classic hall, a Jacobean dining room, a Gothic library, an English drawing room, and a Rococo boudoir fail to impress one with any feeling for the work as a whole, but to excite rather the somewhat wearying interest that one takes in a museum.

Art then is only real art when it infects the spectator (to confine ourselves now to architecture) with a feeling which is original with the artist. If it is original with the artist it must be new to the beholder, and Tolstoy says, "An art-product is only a genuine art-product when it brings a new feeling (however insignificant) into the current of human life." It is this effort after something new that has led designers to aim at what is striking or interesting. It is a mistake. The path to originality lies in renouncing originality. This is no great paradox when we come to see what it means.

Whoever heard complaints of monotony in the appearance of the human face ? The poet may write "a sonnet to his mistress' eyebrow," fifty times and not repeat himself, if he only has fifty mistresses. No artist tries to improve upon the human nose when he paints a face. Ridiculous as the human nose is, its Creator has made it a beautiful object when its proportions are strictly suited to its needs. Striking

effects do not improve it, nor do interesting embellishments. Why then should we hope to improve our own creations by going outside of their functions for our inspiration ? Why when we wish to procure the charm of freshness in our work in spite of the similarity of one problem to another, should we seek for any other inspiration than its functions, when we see how the human nose, with its similar functions and its similar form in all the multitudes of men, is nevertheless always new ?

Here is Count Tolstoy's recipe for the production of infectious—that is to say of original—art. "The stronger the infection," he says "the better is art, as art, speaking now apart from the subject matter.

"(The fourth quarter of his book is devoted to the condemnation of much of the subject matter mentioned in the quotation from him, in the earlier part of this article, as being art. He considers no art to be good art which does not transmit either the feelings of religious perception or the simplest feelings of common life. And its function as one of the means of human intercourse is to unite men in feeling. Hence he excludes all art that transmits church or patriotic feeling or the feelings pertaining exclusively to the aristocratic and idle rich. These views however cannot be considered in the present article).

To return to the recipe for producing infection. Count Tolstoy says : "the degree of the infectiousness of art depends on three conditions.—(1) On the greater or lesser individuality of the feeling transmitted ; (2) on the greater or lesser clearness with which the feeling is transmitted ; (3) on the sincerity of the artist, i. e. on the greater or lesser force with which the artist himself feels the emotion he transmits."

Now these three conditions may, as the author himself says, be summed up in the last, sincerity ; for if the artist is sincere—as each man is different from everyone else, his feeling will be individual for everyone else ; and, if he be sincere, he will be sure to be clear.

It is thus that renunciation of originality is the way to originality, for the designer must lose himself in his problem if he is sincere. And the encouragement to do so is that it is only when this imagination is thoroughly infected with his problem that he can express it so as to infect with his feeling those who look upon his work.

W. A. LANGTON.

#### ARCHITECTURAL MATTERS IN TORONTO.

The Toronto Chapter of the O.A.A. have decided to establish for the benefit of the members a class on the History of Architecture. The first meeting will be held in the O.A.A. rooms, 94 King Street, West, on the first Monday in December between the hours of 5 and 6 p.m. Under the direction of Mr. W. A. Langton the class will first take up the Norman period, and later the Early English period under the direction of Mr. John Gemmell.

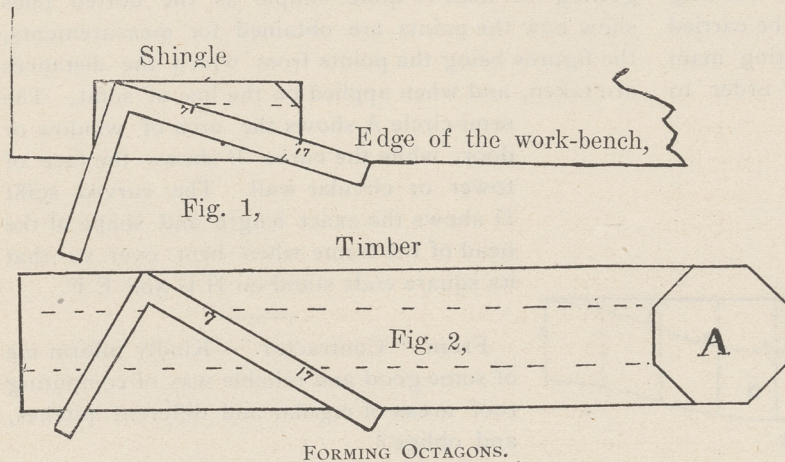
A Committee composed of Messrs. Symons, Wickson and A. H. Gregg has been appointed to take charge of the scientific classes in connection with the educational work to be undertaken jointly with the Toronto Architectural Eighteen Club. Professional teachers will be employed for these classes, which will be of such a character as will prepare students for entrance to the School of Practical Science.

On the evening of the 11th inst. the members of the Toronto Chapter and of the Toronto Architectural Eighteen Club met in the rooms of the Association and discussed with Mr. A. F. Wickson the revision of the city building by-laws.

## INTERCOMMUNICATION.

[Communications sent to this department must be addressed to the editor with the name and address of the sender attached not necessarily for publication. The editor does not hold himself responsible for the expressions or opinions of correspondents, but will, nevertheless, endeavor to secure correct replies to queries sent in. We do not guarantee answers to all queries neither do we undertake to answer questions in issue following their appearance.]

From a "Manitoba Builder": Is there any quick method of "laying out" the ends of shingles in semi-



FORMING OCTAGONS.

octagon shape, also of gauging off timber to make it octagon shape?

Ans:—The following diagrams and explanation are submitted, which we think will meet our correspondent's requirements. Plane the shingles even with the edge of the work-bench, as shown at Fig. 1, and at 7

be set, where gauge lines—shown by dotted lines—must be made. These lines, of course must be made on the whole four sides of the timber, and the wood must be removed from the corners to these lines, when the octagon will be complete as shown in section A. The width of shingles or timber makes no difference. This method may also be used with success in the rounding of timbers, such as masts, spars, or flag staffs. First make the timber octagon and then work off the angles until the rounding process is complete. If the timber is to be tapered, lay off each end of the stick, and then instead of gauging, strike chalked lines to the points where the timber is to be removed.

From a "Young Builder": I wish to heat a small house of my own with hot-water, but, as it is impossible to have any cellar or basement under the house I will be compelled to place the boiler on the same floor on which most of the radiators will stand. There will be 5 rooms down stairs and 4 above to heat. Can I do this in such

a way as to be successful, and not to cost more to run when completed, than if the boiler was in a cellar?

Ans:—With regard to this query we cannot do better than quote the following on the subject, which is from an authority: "Buildings in which similar conditions exist are successfully heated with hot water

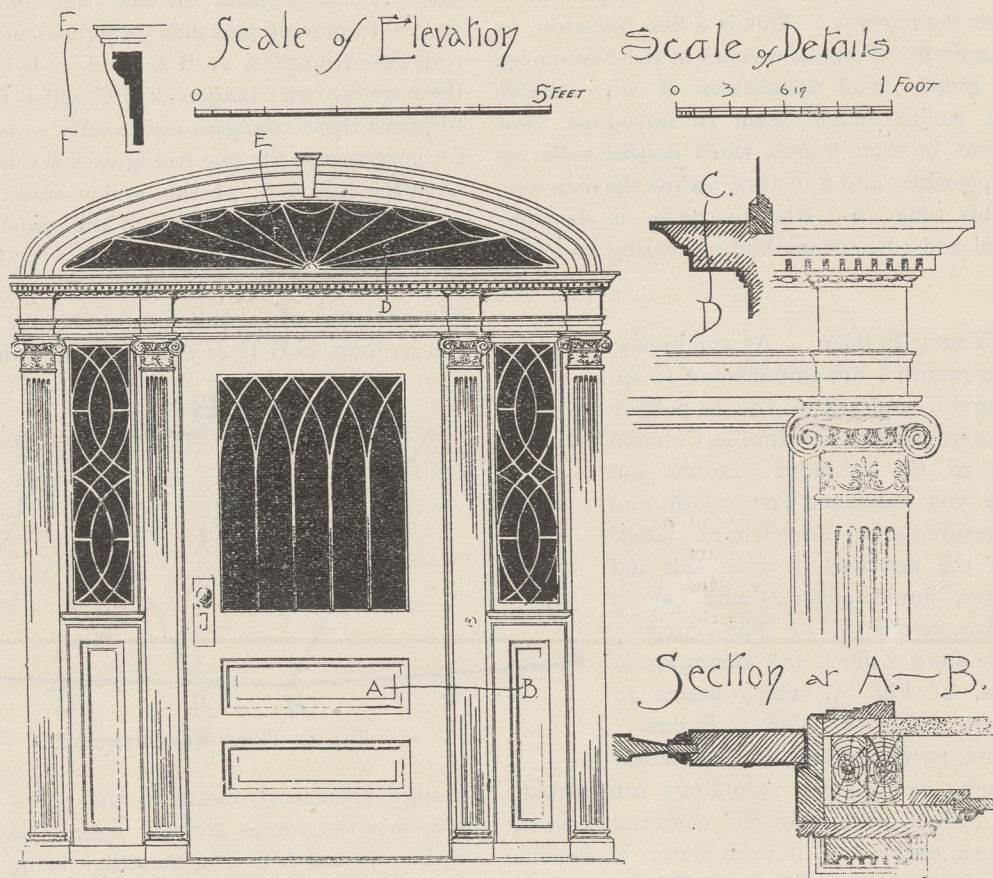


FIG. 3.—FRONT DOORWAY—COLONIAL STYLE.

and 17 inch marks on the steel square will be the points on the end of the shingle from which the corners may be cut. To make a square timber octagon, place the steel-square diagonally across the timber as shown at Fig. 2, and mark where 7 and 17 inches are shown on the square, and these points will be the distance from the edges of the timber to which the gauge must

be set, where gauge lines—shown by dotted lines—must be made. These lines, of course must be made on the whole four sides of the timber, and the wood must be removed from the corners to these lines, when the octagon will be complete as shown in section A. The width of shingles or timber makes no difference. This method may also be used with success in the rounding of timbers, such as masts, spars, or flag staffs. First make the timber octagon and then work off the angles until the rounding process is complete. If the timber is to be tapered, lay off each end of the stick, and then instead of gauging, strike chalked lines to the points where the timber is to be removed.

this top horizontal main to the radiators placed on the lower floors. The returns from these radiators may be carried below the floor joists and rise to connect with the boiler, if that is of any advantage. Care should be taken to secure a proper pitch to the pipes and to cover those which are exposed, so as to prevent undue loss of heat or freezing. Arrangements should be made at the lowest point of the system to draw off all the water in case repairs are needed or the building is to remain unoccupied. A small pipe can be carried from the highest point in the horizontal heating main on the upper floor to an expansion tank, in order to

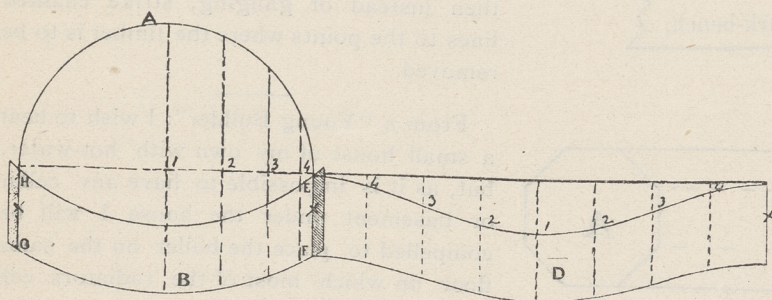


FIG. 4.—DOUBLE CURVATURE.

allow the air in the system to escape as it is filled with water. In any system of heating it is well to secure a boiler and radiators of ample capacity for the work, using piping of generous size." With regard to the foregoing, perhaps some of our experts in heating matters, may answer the questions asked, at greater length than the quotation, and we should be pleased to give space for the purpose. This is a live question, as there are hundreds of house owners in the Dominion, who would gladly avail themselves of any reliable scheme that would enable them to introduce "hot water" systems in their homes when neither collar or basement is possible; and a fortune awaits the man who will devote his time—and who succeeds—in devising an economical and efficient method of heating from the "level."

From a "Young Builder": As you kindly answered my query last month I am emboldened to approach you again, and ask of you to publish a design for a front door entrance in Colonial style, suited to the verandah column and tower cornice you published last month, and which, I can assure you, were much appreciated. I would like the doorway to have side and transom lights, fluted pilasters with carved balusters. Any details will be appreciated.

Ans.:—We show a door and doorway in colonial style, at Fig. 3, which seems to accord with the wants of "Young Builder." If too elaborate, portions of the ornamentation may be left out, and plainer mouldings substituted: though any serious change in the elaboration would spoil the general effect, and, it were better, if possible to execute the work just as shown. The design and details are drawn to scale, and the sections are self-explanatory and easily followed.

From "Boss Carpenter":—I am anxious to know how to make, or rather "lay-out" work for window and door frames, having semi-circular heads, that are to be placed in circular towers or other circular walls.

In fact, what I wish to know is how to obtain the lines for getting the veneer soffit for double curvature?

Ans.:—A method, showing one way of getting out this work, may be found in back numbers of this journal, but we present herewith another example which we think our correspondent will find simple. We suppose the jambs to be parallel with each other as shown at H G and E F, Fig. 4; then the method of getting the soffit is quite simple as the dotted lines show how the points are obtained for measurements, the figures being the points from which the distances are taken, and when applied on the line of soffit. The

semi-circle A shows the arch of window or door, while the curve B shows the face of tower or circular wall. The curved soffit D shows the exact length and shape of the head of the frame when bent over so that its square ends stand on H G and E F.

From "Contractor."—Kindly inform me of some good and reliable way of computing roof areas of regular and different pitches, and oblige?

Ans.:—When the roof is all made to the same pitch the area is just the same, whether it is all in one plain gabled roof or is cut up into any number of gables, or with hips and valleys, the only difference being that the more breaks there are the more labor required, and a greater waste of material. This principle may be illustrated as in Fig. 5, in which the gable A C D projects on one side of a plain gable roof. In placing this side gable we cut from the main roof two triangles, A B E and E B D, and replace them by the two triangles A B C and B C D. It is easy to prove these triangles are exactly equal. Let us take for comparison the two triangles A B C and A B E; they have the side A B, or the valley rafter, in common, and, since the side gable is of the same height as the end one, A C is a common rafter and of the same length as H I and E B, also A E must equal G H; but since the side gable is plumb, the ridge B C is just as long as G H or A E, hence all the sides of one

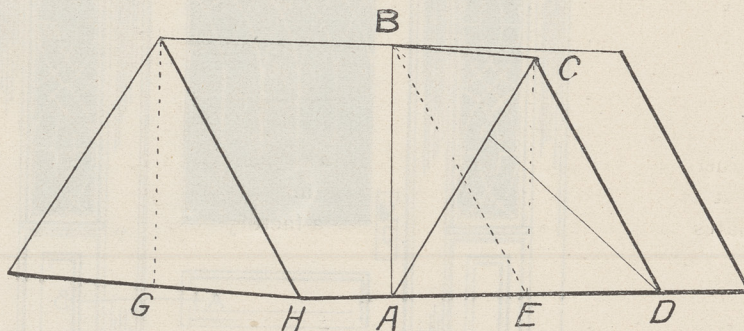


FIG. 5.—ROOF MEASUREMENTS.

triangle are exactly equal to the sides of the other, and since the angles are also equal, the angle A C B in the one and A E B in the other being right angles, the triangles are equal as must be admitted. This is only one illustration, but it covers the whole ground of equal pitched roofs which may always be estimated as if they were plain gabled roofs, only allowing extra for hips and valleys on account of waste, or for overlapping projections. Knowing the foregoing, we may apply another simple rule to the calculation of roof areas of equal pitch: First find the area of a floor, or

rather the flat area covered by the roof to the outside of cornice projection, multiply this by the length in inches of the common rafter for one foot run and divide by 12, and you have the area of the roof. When the roof is made up in parts having different pitches, the rule just given may often be conveniently employed. Find the flat area as before covered by the roof of each given pitch and multiply this by the length of the common rafter for one foot run of that pitch, remembering that if the length for a foot run be taken in feet the product will be square feet, but if taken in inches the product must be divided by 12 to reduce to feet. The sum of the areas thus obtained, will be the area of the roof. The area of a roof having different pitches can be obtained by dividing it into triangles or rectangles and calculating the area of each, but this is a tedious way and no more exact than the rules given herewith.

#### THE DEVELOPMENT OF ROLLED BEAMS.

There have been so many engineering triumphs during the nineteenth century and there are so many champions to uphold the supremacy of particular examples, it is not surprising that their relative value has not been established. But as regards statical construction nothing arose during the century to surpass the determination of the forms of beams and columns, says the London Builders' Reporter. Previous to 1820, when Tredgold by means of experiments on a small scale was able to ascertain the most efficient section of a cast-iron beam, the forms which were in use would now be considered as absurd. The limitation of the resistance to extension offered by cast-iron was, however, an obstacle to its general employment for beams. The elaborate and costly experiments of Eaton Hodgkinson and Fairbairn, which were confirmed by those ordered by Robert Stephenson to discover the most suitable form for a wrought-iron beam which would serve as a substitute for cast-iron, were crowned with success. It was established beyond doubt that with two horizontal flanges united by a web a beam was produced of which the strength could be calculated beforehand, and which was not liable to the uncertainties or accidents which diminished the confidence in the use of cast-iron. The flanges might take the form of a series of cells or chambers and the web might become a framing of struts and ties, but the principle of a great structure like the Britannia Bridge was identical with that of a small girder made up of angle-irons and plates and which could be utilized for a factory floor or for a bridge over a lane. From that apparently simple conclusion structures have become possible which have not only revolutionized the practice of bridge building, but have enabled civil engineering to accomplish its main purpose of facilitating communication between men.

The simplicity of the normal wrought-iron beam was an inducement to inventors to devise arrangements for its production by rolling. If angles, tees and channels could be turned out in unlimited quantities, why should not a form which might be described as a double tee or a quadruple angle iron with a web be also feasible? Various sections of rails could be rolled, and why not I beams or joists? A strike of carpenters in Paris had extended the use of iron, and, moreover, English architects began to realize the advantage of having floors which resembled the French, and in which rolled

iron was an element. The production of joists was therefore quickened, but for a long time the sections were limited in their dimensions. An increase of size was effected with difficulty. Twenty years ago the great Cockerill Company in Belgium rolled no larger sections than  $12\frac{1}{2}$  inches by  $6\frac{1}{4}$  inches for iron, and  $8\frac{5}{8}$  inches by 4 inches for steel. The biggest steel joist which has been available up to the present measures 20 inches by  $7\frac{1}{4}$  inches, although the Americans have a 24 inches by  $7\frac{1}{2}$  inches. The difficulty is as much with the width of the flanges as with the depth. As a rule the flanges were supposed to measure one-half the length, and thus such proportions as 12 inches by 6 inches, 10 inches by 5 inches, 8 inches by 4 inches, 6 inches by 3 inches, have become familiar among builders. After a certain limit the proportion is diminished—16 by 6, 14 by 6 and  $17\frac{3}{4}$  by  $6\frac{3}{4}$  are recognized market sections.

The inefficiency arising from the inadequacy of small size sections was overcome. Plates have been added to increase the width of joists, and two or more have been rivetted together in order to obtain the desired height. At one time it was generally accepted that for all girders which exceed 12 inches in depth it was economical to construct them of plates and angle-irons, but in a great many cases there is not sufficient time for the building up of beams.

What we have said is of course familiar to our readers, but it will help to explain the satisfaction in which every growth in size of rolled joists is received. The whole history of the world, it has been stated, would have been altered if Cleopatra's nose had been an inch longer or shorter. The possibility of being able to obtain a 24-inch instead of a 20-inch girder may have an important influence in fixing the character of a building. What, then, is to be said of an improvement in rolling mills by which 30-inch girders can be as easily procured as 7-inch joists were at one time? The advantages would be difficult to estimate on account of their vastness.

But increased length is only one of the improvements which architects and engineers have long desired in rolled joists. The new Differdange beams can also have no less a breadth than 12 inches, or nearly 5 inches in excess of what has been available. The old ratio no longer rules in them, for it is possible to obtain sections in which the height and width correspond. The following are some of the sections which can now be ordered:— $9\frac{1}{2}$  inches by  $9\frac{1}{2}$  inches, 10 inches by 10 inches,  $10\frac{1}{4}$  inches by  $10\frac{1}{4}$  inches,  $10\frac{5}{8}$  inches by  $10\frac{5}{8}$  inches, 11 inches by 11 inches,  $11\frac{1}{2}$  inches by  $11\frac{1}{2}$  inches, 12 inches by 12 inches. Then we can obtain a whole series of sections between  $12\frac{1}{2}$  inches and  $29\frac{1}{2}$  inches in height which have flanges with a width of 12 inches.

It is needless to point out the power of resistance which is derived from the increase in the width of the flanges. In calculating the strength of a girder we have to consider not only the area of material but the breadth and depth. In many cases the depth or height has to be reduced to a minimum, and the loss of advantages must be made up by greater width. For instance, a 16-inch by 6-inch joist is supposed to carry a safe load of 20 tons on a 20 feet span. But a 12-inch by 12-inch joist would perform the same work and allow a saving of 4 inches in the depth of a floor. Girders should be always sufficiently deep, but when space has to be measured in fractions of an inch compensation must be found in width. There are also numerous other cases where width is essential to steadiness. When steel joists are used for columns or stanchions the width of flanges aids stability to an extraordinary extent.

## NOW—AND THEN.

## IN THE SUMMER.

"Wot ! go up that blooming ladder, which is near three storey high ?

Oh, chuck it, guv'nor, not much ! Why you'll ask me next to fly, Or hang on by an eyelash to the gutter's dizzy height.

It's June, you must remember, and the sun is shining bright.

You'll get other men to do it ? and a chap's been round to-day Who said he'd take the top stretch ? Well, he's a blooming 'jay.'

I'm a painter, that's wot I am, not a bloomin' acrobat ;

You can get some other feller, I'm not going up, that's flat,

Aye, here's my brush and duster, and a large and small sash tool,

So dub up the 'spondulicks.' Do you take me for a fool ?

I've worked for all the best firms for twenty miles around—

They don't want me to take top stretch, I'm always on the ground.

I'm a painter, that's wot I am and a clubman, too, to boot,

So your offer of the top stretch work it ain't agoin' to suit."

And while his back time's reckoned up, he's grumbling ad lib.

He's a very curious fellow in the summer is the "skib."

## IN THE WINTER.

"Paint the cornice hanging over with a rope around my waist ?

All right, sir, we can 'rush' it. Now, youngster, you make haste,

Fix the rope around my arm pits. Sixty feet ? Pooh, that's no height.

I can walk along the coping, for my weight it is but light,

I wouldn't give it three coats, sir. We'll manage it with two ;

And if it had a coat of size, I think, sir, one would do.

And before you go, there's one thing I should like to mention, sir.

Bill's been sloping round the corner for a pint, which isn't fair,

I don't wish to say a word, of course, about a feller mate,

But when he came this morning he was twenty minutes late.

And that other chap you've got on don't know how to behave, he Was larking all the morning in the kitchen with the slavey.

I sees you have contracted for to paint the staircase wall ;

We can fake it up by washing it—it won't want paint at all !

I know you've had to take it low, for work you can't refuse.

Leave me to do the 'faking' dodge. I'll see, sir, you don't lose.

We'll rush the work through proper !" And his promises ad lib.

In the winter are forgotten in the summer by the "skib."

—H. F., in Decorators' and Painters' Magazine.

## SANITARY HOUSE DECORATION.

A paper on this subject read by Mr. Louis Hanks at the recent Congress of the British Sanitary Institute held in Manchester, contains many useful suggestions. He advised decorators, in commencing the sanitary decoration of a house, to begin at the top—in the loft if there is one—and work downwards, cleaning and removing dirt from all recesses and hidden corners as they went. Such places are often, he added, overlooked and left as disease spots in a smart house. The loft especially receives the floating dust and impurities in the vitiated air arising from the lower parts of the house ; therefore clean it out, remove all dirt, provide that a skylight can be opened, and brush down and whiten every part of the walls, floor, and under-surface of roof, either with limewash or carbolic distemper. Do not leave the open joisting or rough plaster to accumulate more dirt, but put a thin flooring all over the loft and thus gain useful storage room, which, being lighted and ventilated, will make the whole house healthier. Where air and sunlight can enter, microbes will be conspicuous by their absence. Every scrap of old paper on walls or ceilings, and all old distemper throughout the house, should be soaked, scraped and washed off to the bare plaster, except perhaps in the case of a tightly-hung varnished or painted paper, which already presents an impervious surface. Insist, as one of the first principles of sanitary decoration, on the stripping of walls and ceilings, and

disregard all pleas or fears as to fetching down the loose plaster. If the plastering is so weak that it is held up by the paper or old whitewash, that is surely a pretty good indication that it needs repair. The desirability of enforcing the stripping of old wall-paper and distemper by the passing of a by-law to that effect may be commended to the attention of sanitary authorities. Always use some disinfectant in the water employed in stripping and washing down the interior of a house, both as a sweetener of the rooms and as a protection for the workmen in case there may have been infectious illness on the premises. Safe and effective liquid disinfectants are so cheap nowadays that there is no reason for omitting this simple precaution.

A solution of soda in warm water facilitates the removal of old paper and the effective cleansing of the surface. Wherever there is a sign of dampness trace and remedy it at its source, to protect health and prevent damage to the decorations. In slight cases it may suffice to line the damp wall surface with lead foil or pitch-paper or to paint it before repapering, but all serious dampness should be thoroughly removed. Having stopped all cracks or imperfections in the plaster with Parian or Keene's cement and rubbed down the plaster to an even surface, the walls and ceilings are ready for decorative treatment, which must depend on individual taste and the finances at command. In clairecolling or sizing walls or ceilings preparatory to papering, and also in the process of distemping, the smell of size is often very offensive, and that is not to be wondered at when its organic nature is considered. This odour can be almost entirely neutralized by the addition of a gill of turpentine to a pailful of melted size or distemper. This is actually an improvement to the body and binding properties of the material as well as a deodorant.

In hanging papers, embossed pulp, or canvas materials or painted or varnished surfaces, a clairecolle of size and soda should be used—half a pound of soda to a gallon of melted size—to give a "bite" to the material to be hung, and to prevent blistering. The clairecolle for unpainted surfaces should be melted size with a little whiting and turps as aforesaid, no water. Many of the sanitary, washable distempers or water paints—so largely employed nowadays—contain a percentage of turpentine, boiled oil, or other vehicles, as well as an admixture of dry white lead, zinc white, or soluble glass, together with some disinfectant. Such truly sanitary pigments cannot be too highly commended, as they are cheap, produce artistic and durable effects, and possess better covering properties than oil paint. One hundred-weight of such a distemper will cover 840 sq. yd., while the same quantity of oil paint will only do an average of 500 sq. yd.

Little need be said as to the composition or application of paint to walls or woodwork beyond urging the use of zinc white (oxide of zinc), or Charlton white, as being non-poisonous, and therefore more sanitary than white lead (carbonate of lead), the poisonous nature of which is well known, although it may be safely used with proper precaution. If white lead paint be used it should be genuine old, ground white lead, mixed with pure American turps and Baltic linseed oil, with the addition of litharge driers or terebene, according to the weather in which it is used ; and such paint gives off little or no odour or volatile particles. Do not use

cheap white lead, as it is often adulterated with barytes (sulphate of barium), and avoid new lead, as it is deficient in covering properties and damages the colour in its oxidation.

White paint is the most healthful of all paints, because, apart from its artistic effect, it shows dirt better than coloured paint, and thus indicates the necessity for cleaning. A glossy surface is more sanitary than a dull or "flatted" surface, as it affords less hold for dirt. In selecting papers or decorations for the walls of bedrooms, and indeed for all living rooms, avoid large staring patterns, and aggressive contrasts of primary colour in masses. The less pattern there is the better; a simple background of agreeable tone is more restful and suited to a bedroom than any assertive decorative treatment. A room simply decorated with a pale cream (not blue white) ceiling and cornice, cream enamelled woodwork, and papered, painted or distempered walls in a tint of soft non-arsenical green or blue, for a warm, sunny aspect, or in warmer tones of terra cotta, pink, or yellow for cold, dark rooms, will be quicker and more soothing to the senses, and thus more conducive to repose than more gaudy treatments. In purchasing paperhangings take care to procure them from a firm of repute, who can furnish an authentic guarantee that no arsenical colours or other poisonous ingredients are employed in the process of manufacture. The fermentation of the paste used in hanging papers and relief materials is a danger which can be avoided by the addition of a lump of alum, the size of a filbert, to a pail of paste. This helps to thicken the paste, giving better and more adhesive body, as well as having a hardening and non-fermentive action. The addition of a small quantity of oil of cloves also assists in checking fermentation.

Lastly we have to consider the floor, which should be sized and varnished all over, merely having a loose rug, thus providing a thoroughly sanitary surface, which can be kept clean and germ-free without the use of the scrubbing-brush. All open joints should be stopped to prevent dust dropping through into the space beneath. Permanganate of potash is an excellent dark stain for clean floor-boards, and has the additional merit of its disinfecting qualities. The same general principles apply to the decorative treatment of the reception rooms, staircase, etc. Paperhangings, where used, should be, preferably, those with a hard, smooth surface, such as the hot pressed silk fibres or oil printed papers, not flocks nor mica papers, which catch the dust, and whose particles become detached in course of time, thus failing to comply with sanitary requirements.

Painted and panelled walls and ceilings, hand-painted decorations in flat-ornament in monochrome, colour, or stencilling, with the embellishment of gilding in mouldings, and other ornamental details; plaster or compo-mounted enrichments, hardwood panelled wainscoting, parquet floors, and every kind of decorative treatment that does not afford absorbent surfaces or dust-collecting ridges, shelves or scrolls may be freely employed in entirely sanitary scheme of decoration.

In bathrooms and toilets do not have wooden enclosures to baths, sinks, or w.c.'s, as such places frequently serve to harbour filth, and thus become a nuisance. Let every part of the sanitary fittings be open and above-board, so that any leakings can be de-

tected, and every part accessible for daily cleaning. Corners behind w.c.'s and corners of rooms generally, would be more hygienic if slightly rounded to prevent the collection of dirt. The walls of bathrooms, lavatories, and the domestic offices should be covered with varnished paper, paint, or preferably, with ceramic or enamelled metal tiling, so as to be impervious and washable. The latter forms of wall covering are strongly to be advocated for larders, pantries, and store-cupboards. The floors of bathrooms, w.c.'s and lavatories, also larders, should be cemented or asphalted. Mosaic of marble or glass is a material more often employed for the flooring of halls, steps, and lavatories in this country than for mural decorations, due chiefly to questions of cost, but it is a matter of regret that this sanitary, artistic, and durable material is not more largely used for decorative purposes.

In conclusion, a word may be given to the necessity for ample inlet and outlet ventilation for every room, to promote the health of the occupants and to preserve the decorative adornments. The least injurious form of artificial lighting in all respects is the incandescent electric lamp, and where gas is used every burner should have outlet ventilation to carry off the fumes. Carefully search for cupboards under stairs, also cellar or vaults. See that all such places have cement floors. Limewash them twice a year, and do not let lumber and dirt accumulate. Abolish brick or wood dustbins, and have iron portable pins. Bear in mind that soap and water, fresh air, sunlight, and cleanliness in general are as much to do with health as elaborate drainage and the complications of modern plumbing, and there is the advantage, moreover, that such simple things are within the reach of all.

#### REQUIREMENTS OF A SUCCESSFUL CONTRACTOR.

A contractor, to be successful in turning out good work and in making money, must possess a great amount of practical ability; he must thoroughly understand, practically, every branch of his work in its ever-changing phases; besides he must have acquired a fair smattering of the theoretical side, to understand, if not to calculate, the laws of strength and stability. If he be a bricklayer he must have an idea of the principles of foundations, arches, piers, buttresses, etc., besides a rough knowledge of the chemical and physical properties of limes, cements and other materials. If he be a carpenter, a knowledge of the governing principles of roof and other trusses, beams, columns, etc., is indispensable, and an intimacy with the nature of woods is also essential. If he be a plumber, a familiarity with sanitary science and an insight into the laws of traps, vents, flow of water, and a hundred and one other points is imperative. And so on through every trade—in short, we are brought face to face with the survival of the fittest ultimatum, that to attain to full success a contractor must understand all about his particular line of work that he can learn by watchful experience and by incessant, unremitting study during his spare moments.

It may be said that it is impossible for a contractor to study any theory because his education is, as a rule, such that it does not fit him to understand formulas and technical terms, and, even could he elucidate them, he, as a rule cannot spare the time. All that

can be said in reply is that if he has the slightest desire to get to the top of the ladder, he will find the time or make it, and he will repair or replenish his education up to the point which is necessary to understand the said formulas and technical terms. This can be no difficult task, for in the market there are hundreds of plain, simple, reliable books on each trade, easily gotten hold of and as easily understood, teaching the computation of strains and how to meet them, the guiding rules, etc., in such simple form that the most ordinary education can fully grasp them. Then again he will contribute greatly to his own interests by subscribing to a couple of trade journals devoted to his own line and to at least one architectural paper. These will keep him in touch with new methods and practices being perfected or brought out and with newly-introduced materials, tools and other mechanical devices. In addition he should be the possessor of a library of trade catalogues, which he should study carefully and repeatedly. Technical journals supplemented by trade catalogues are without doubt the very best educative mediums that a contractor or mechanic can possess. The more knowledge a contractor can acquire the more confidence he naturally will receive from his employees, and this knowledge he should try as far as possible to transmit to them; he should endeavour to make them thinkers and students as well as workers.

A thorough acquaintance with business methods is imperative. Book-keeping, banking, exchange, correspondence, etc., should be to the contractor familiarities. This knowledge can be easily acquired if both eyes be kept open and a little assistance be sought from some qualified friend.

#### THE STONE RESOURCES OF NEWFOUNDLAND.

Newfoundland has heretofore attracted attention in the way of its stone resources mainly by its deposits of slate. The quality of this material is declared to be equal to the Welsh product, and a determined effort is being made to exploit the various deposits found in the province. Until very recently little had been done in the way of quarrying stone. Most of the stone produced was used for macadam and paving blocks, and there was some little activity in the gathering of the round beach stones, which are used for rough cobblestone pavements. The recent reports of Prof. James P. Howley, F.G.S., the Director of the Geological Survey, show that the people of the provinces are beginning to take a greater interest in the stone resources, and that some of the native stone is being employed for building operations. The new Court House at St. Johns is built entirely of sandstone from Kelly's Island, Conception Bay, faced with syenite from Mr. Ellis's quarry near Petite's South Coast. These form an excellent contrast, and their durable character is unquestioned. A new wing has recently been added to the Lunatic Asylum, constructed of Signal Hill sandstone. There is a great quantity of similar stone in the hills and ridges in the vicinity of St. Johns, and this has been used in a number of churches and public buildings. It has been used extensively also in such works as retaining walls, foundations and the like. The industry, however, is of a desultory nature, and is only active when some large structure is in the course of erection. A few

farmers and others devote a portion of their leisure time each fall and spring to quarrying in the vicinity of their homes, and usually find a ready sale for the small amounts they take out. The Signal Hill stone is of excellent quality for rough work, and a considerable industry could doubtless be built up if quarries were opened and conducted in an enterprising and up-to-date way.

Prof. Howley says that stone fit for building, structural or ornamental purposes is abundant in many parts of the island. Sandstones of many colors and various degrees of texture are very common in the Lower Carboniferous series of Codroy and Bay St. George districts. Limestones also abound in the same region, some of which would make handsome marbles, while others are adapted for burning into lime. Serpentine of many varieties and great beauty are met among the magnesian group or metamorphic series, wherever the latter attain any considerable development. A very beautiful green variety of an attractive appearance admirably suited for ornamental purposes comes from Tilt Cove in the vicinity of the copper mines. Many varieties of soapstone exist in connection with the serpentine deposits, and beautiful ornamental stones may be encountered in various parts of the country, such as red, yellow and variegated jaspers, amethystine and opalescent quartzite, handsome porphyries, syenites, traps and amygdaloids and a variety of other rocks too numerous to specify. Many of these have been cut and polished and set in jewelry.

With regard to slate Prof. Howley says: "The operations at the Wilton Grove slate quarry in Smith's Sound were actively prosecuted during the year, resulting in a large increase in the manufacture and exportation of roofing slate. The output was about 2,000 tons, equal to 6,000 squares, valued at \$22,500. The slate is made in two sizes, 20x10 and 24x12. It all went to the English markets, the former to Newcastle, the latter to London, where a ready sale at remunerative prices was paid for it. This quarry is now a well established industry. I paid it a visit last autumn, and was surprised at the work being accomplished. A fine pier was in course of construction along the water front, being filled in with the waste from the slate. Vessels of almost any size could lay alongside within a stone's throw of the quarry, and in perfect safety. A large space immediately in the rear is used for storage purposes, where a splendid display of slate lay piled in tiers awaiting shipment. About 50 men were busily engaged with Ingersoll steam drills quarrying huge slabs from the cliff. These were swung by derricks on to trolleys in waiting and quickly moved to the sheds, where a number of Welsh slaters were busy cleaving and dressing the material into the required dimensions for roofing purposes.

"So far no attempt has been made to manufacture any of the other articles for which this slate is equally well adapted, but I understand the plant requisite for such purposes is soon to be installed.

"The slate is of various shades of color, dark purple prevailing, but there is also a band of pale sea green of beautiful texture. The quarry is of immense proportions, and there is sufficient material in sight to last for generations.

"Several new deposits have been located within the past season similar in geological age to that of the

Smith's Sound quarry. Some of the large Welsh firms are beginning to take an interest in the possibilities of this country as a slate producer, little, if anything, inferior to their own. One of these firms informs me that our slate is much superior to any imported into Great Britain from foreign countries. They add that there is a great future for slate in Newfoundland."

Aside from the slate quarries at Smith's Sound there are other deposits of slate in the neighborhood that will well repay development. There is a tract at Keels, Bonavista Bay, controlled by a gentleman in New York, which was worked in a small way some years ago. Samples of slate from this property show that it is excellent in color, quality and cleavage. The vein faces the water, running half a mile or more along the shore. It goes inland about the same distance. At certain seasons when the weather is favorable boats could be loaded in a cove on the property. When this would not be available there is a good harbor but a short distance away. The slate is of the true Welsh purple, and there is plenty of the unfading green. It is undoubtedly the same vein that is found at Smith's Sound. This would have certain advantages that are not to be found at the latter place. Close to the quarry is the small fishing village of Keels, with 200 or 300 inhabitants. Five miles away and connected by a good road is the seaport town of King's Cove. The absence of any settlement near Smith's Sound makes it difficult to keep the quarrymen at work longer than two or three months. The Keels quarry could also be worked very economically. The top is only five to ten feet, and some good slate could be taken from this. The joints are regular, so that blocks could be taken out easily. There would be little expense in removing the waste, as the sea would carry much of it away. This property has been brought to the attention of slate men in England, and it is probable that it will be fully developed before many months. The Newfoundland slate is very popular in England, and there is no difficulty in selling it, even in competition with the Welsh product.

Prof. Howley reports that the Reid Newfoundland Company vigorously prosecuted work at their granite quarry near the Topsails during the greater part of the summer of 1901. Much of the material raised was utilized in bridge construction, and a large amount was dressed for a new railroad station to be erected at Riverhead. They also manufactured 14,000 paving blocks.

Among the resources of the province that Prof. Howley thinks would well repay the development are gypsum, asbestos and mica. In the district of Bay St. George there are immense deposits of gypsum. Between the years 1891 and 1894 a considerable amount was exported from this locality to the United States, but since then the fields have remained unproductive. In Canada the gypsum industry has attained to large proportions. Asbestos and mica are known to exist in large quantities on the Labrador and in the Island of Newfoundland. Much of the short fibre asbestos could be used for plastering purposes, this material, under the name asbestic, being very popular in the Canadian provinces. Mr. Howley says: "From what we know of our Labrador territory there would appear to be in that region room for a vast mica industry in the near

future. It is certain that the country possesses an abundance of the material of large size and superior quality, nor is the Island of Newfoundland itself destitute of some good mica."

#### DEMOLITION METHODS.

It is interesting to learn something of the methods employed by the Chicago Wrecking Co. who were given the contract to remove and dispose of the Pan-American Exhibition buildings. A force of 700 men was employed on the work. Railway sidings were laid in the grounds, forming a circuitous route, but in contact with each of the palaces. The materials were despatched to various parts of the States. Some of the buildings were sold in their entirety. A sawmill was erected on the grounds, and every piece of timber cut into given lengths and sizes. Even the nails were assorted as soon as drawn. Glass windows, piping, flooring, ironwork, machinery, doors and sashes and fittings will all be used again. The "staff" taken from the buildings was sold to farmers as a fertilizer. A catalogue was prepared by the Wrecking Company and distributed throughout the country. The material ordered was sent direct to buyers from the Exposition grounds.

#### ADHESIVENESS OF MORTAR.

The well-known French expert in building materials, Mr. R. Feret, considers that if a mortar does not possess good adhesive qualities it must be condemned. He has recently concluded exhaustive investigations of the adhesive powers of mortars, from which he draws the following conclusions: The adhesive power of a mortar varies with the nature of the surface of the substance to which it is applied; thus, it depends upon the fineness of the grain of the bricks, and varies directly with their porosity. Low adhesive powers seem independent of the dimensions of the inequalities of the surface of contact, so that stone has no advantage over brick; in fact, the total breaking load is almost the same, in the case of a good sand mortar, whether the surface of contact is smooth or irregular. Clean bricks take the mortar better than dirty bricks, but there is no evidence to presume that old brick work, which has been demolished and squared up, is not just as good as new brick, as far as presenting a good surface for adhesion is concerned.

Very little variation is shown when a given mortar is mixed with Portland cement. Actually the adhesion is greater with bad cement, sometimes, than with better qualities. The finer the grinding the better the adhesive power for the same mortar or cement.

Mortars made with sand are influenced as regards their adhesiveness by the fineness of the grains of sand, and it is curious that the adhesive power is greater, according as the proportion of coarse grains increases. There is, however, a certain ratio between the coarse and the fine grains, which gives the best adhesiveness, and the optimum result is when there are no medium-sized grains present, but only coarse and fine. Adhesive power is not proportioned to the amount of cement in the mortar, and it does not appear advisable to exceed a certain percentage.

The chemical composition of the water has nothing like the significance that has been asserted; it is the quantity that tells. The adhesive quality attains its maximum when the mortar is not only plastic, but inclined to be "sloppy." Beyond this the adhesive quality lessens.

## STANDARD PORTLAND CEMENT TESTS.\*

All experiments shall be carried on, as nearly as possible, at a uniform temperature of 65 deg. Fah., except when tests are being made for the purpose of ascertaining the comparative strength of cements required for winter use.

## (1) PROPORTIONS.

All proportions shall be determined by weight.

## (2) FINENESS OF CEMENT.

For the present, a maximum residue of 10 per cent on the 100 x 100 mesh sieve shall be the test for fineness, and the whole of the cement shall pass a 50 x 50 mesh sieve. The gauge (Stubb's) of the wire shall be No. 35 for the 50 x 50 sieve, and No. 40 for the 100 x 100 sieve. A mechanical sifter, working automatically by jig motion, and thus eliminating personal error, is recommended.

In the case both of hand mixing and sifting with the mechanical mixer, the process shall occupy a definite time, depending upon the weight to be sifted, and the diameter of the sieve. For example, with a weight of 10-oz. of cement, and sieves 8-in. in diameter, the sifting shall be continued  $2\frac{1}{2}$  minutes on No. 120 sieve, 1 minute on No. 100,  $\frac{3}{4}$  minute on No. 60, and  $\frac{1}{2}$  minute on No. 50.

The introduction of small weights, such as washers, into the cement, while being sifted, is to be deprecated, as they tend to push an undue proportion of the cement through the mesh, to stretch the wires and to increase to some extent the grinding. Such practice should not be allowed, excepting on works of construction, where there may be a necessity for ordinary rough tests.

The sieves shall be periodically examined with great care, as moisture sometimes collects on the wire, so that when a residue test is made this moisture mixes with the cement, causing a coating on the wires, and often appreciably diminishing the area of the mesh.

The sand for standard tests shall be quartz, crushed so that the whole can pass through a 20 x 20 mesh sieve (wire No. 28 Stubb's gauge), but sufficiently coarse to allow of the whole being retained by a 30 x 30 mesh sieve (wire No. 21 Stubb's gauge).

## (3) SPECIFIC GRAVITY.

The specific gravity is for the purpose of determining the degree of calcination of a cement with certainty, and is therefore of great importance. The specific gravity of a Portland cement shall be at least 3.09, and shall not exceed 3.25 for fresh cements, the term "fresh" being understood to apply to such cements as are not more than two months old. The gravimetric system is recommended for the determination of the specific gravity.

Portland cement improves with age, provided it is properly stored and kept in air-tight bags or barrels. Specifications, therefore, should not prescribe only fresh cement.

The following description of the method of carrying out this test is taken from a paper on "Testing of Portland Cement," by Gary, Trans. Amer. Soc. of Civil Engineers, October, 1893:

"The determination of the specific gravity of the cement particles by the volume-meter of Schumann is a well known uniform method. This consists of a glass bottle of about 200 cu. cm. (12.2 cu. in.) capacity, with a calibrated glass tube in its neck. The bottle is nearly filled with oil of turpentine, the tube tightly inserted and filled by a pipette with the same oil to the zero mark of the scale, care being taken that all air bubbles are removed. One hundred gr. (3.5 oz.) of cement is put in through the tube, which is then closed by a cork. When the fluid becomes clear, the height of its top surface is noted on the scale. The weight of the cement divided by its volume, as determined by the scale of readings, gives the specific gravity. To secure precise results, it is necessary that the temperature should remain uniform throughout the experiment, and hence vessels, cement and oil must have been kept in the same room for some considerable time. In hot weather the apparatus can be put into water of a known constant temperature. If 100 gr. of cement are used, a rise of 1 deg. Cent., between the two readings decreases the specific gravity 0.8 per cent."

## (4) BLOWING TEST (FOR FREE LIME, ETC.)

The hot bath test for detecting the presence of free lime, etc., shall be carried out in the following manner: Mortar pats, prepared of neat cement and thoroughly worked, shall be troweled upon ground glass plates (carefully cleaned, preferably with acid)

about 5 inches long by  $2\frac{1}{2}$  wide, and  $\frac{1}{4}$  inch thick, so as to exclude all air and moisture.

The pats shall be about  $\frac{1}{2}$ -in. thick in the centre, and shall be worked off to sharp edges on the four sides of the plate. They shall then be covered with a damp cloth and allowed to remain in the air until set, after which they shall be placed in vapor in the Faija bath tank, in which the water is to be heated to a temperature of about 130 deg. Fah. After remaining in the vapor for 6 hours, including the time taken to set in air, they are to be immersed in hot water, and allowed to remain there for 18 hours. Upon their removal from the bath, the samples should not be curled up, should not have fine hair cracks nor be distorted, and should not have large expansion cracks. The samples, if separated from the glass, should break with a sharp, crisp ring. If these conditions are satisfactorily fulfilled, it is believed that no free lime is present in a form that will prove detrimental. Cements, when very finely ground, even if slightly overlimed, are not so liable to blow.

## (5) TIME OF SETTING.

The time of setting shall be determined by noting the time required for a sample under test to bear a needle of  $\frac{1}{12}$ -inch diameter loaded with one-fourth of a pound, and one-twenty-fourth of an inch in diameter loaded with one pound, the mortar under test being of the consistency of rather stiff plaster or mortar. The percentage of water used shall be stated in the report.

## (6) TENSILE AND COMPRESSIVE TESTS.

The strength of Portland cement shall be determined by testing a mixture of cement and quartz sand. The tests shall be made in a uniform manner (both for tension and compression) with briquettes of the same form and same cross section and with the same apparatus.

Neat cement. Neat tests, except where fineness, specific gravity and hot bath blowing tests are also made, are misleading as to the value of a cement. Briquettes of neat cement, in which these characteristics have been determined and found to be satisfactory, shall bear a tensile stress of 250 pounds per square inch at the end of three days; 400 pounds per square inch at the end of seven days, and 500 pounds per square inch at the end of 28 days. All briquettes shall be one day in air, under a damp cloth or in a damp chamber, and submerged in clean water for the remainder of the time periods. Any cement which shows a decrease in strength on or before the 28th day is to be rejected. The decisive tests shall be considered as the average of five briquettes, although for ordinary practice two or more briquettes may be sufficient, and, in the latter case, only the highest test of the group is to be taken as the strength of the cement.

In determining the tensile strength of a briquette, the area of the broken surface shall be measured with great accuracy, as errors sometimes exceeding 10 per cent. are possible unless such measurements are insisted upon.

Sand and Cement. In sand test, the sand and cement must be thoroughly mixed together while dry. After the water has been added, either for neat or sand tests, the mortar shall be thoroughly mixed for a uniform time; suitable periods being two minutes for machine mixing and five minutes for hand mixing.

Briquettes made of one part cement and three parts standard sand, in the manner described hereafter, shall stand 125 lbs. per square inch at the end of seven days, and 200 lbs. at the end of twenty-eight days.

At the end of the same period the minimum compressive strength of a mixture of one part cement to three parts sand shall be 2,000 lbs. per square inch.

[Note. Quick setting cements generally show a lower strength than that specified above.]

The tensile strength of briquettes mixed in the proportion of 3 to 1, or of other sand briquettes, shall not show a decrease either on the twenty-eighth day or subsequently.

In every case the quantity of water used in mixing shall be stated in the report.

The quantity of water to be used in neat tests varies with the kind of cement, fineness, etc., and hence no arbitrary quantity can be specified, the correct method being to bring all mortars to the same degree of plasticity. An apparatus similar to "Viccat's," and consisting of a needle having an area of 0.4 square inches weighted to about 11 oz., may be used.

"The tests are made as follows: A ring,  $1\frac{1}{2}$ -in. in height and

\*Report of special committee submitted to Canadian Society of Civil Engineers, January, 1902.

3-in. in diameter, made of non-absorbing material, is placed on a glass plate and filled with the mortar to be tested, the consistency being such that the needle does not entirely pierce it." (Trans. Amer. Soc. Civil Engineers, Oct. 1893.)

A simple method for determining the standard consistency neat cement tests is to mould a ball of mortar in the hands to a plastic state and drop the same about 20 inches on to the table. If the ball of mortar neither flattens appreciably nor cracks, the consistency is satisfactory. This process corresponds practically with the previous method. The water for standard consistency of 3 to 1 sand briquettes shall ordinarily be 10 per cent. of the sand and cement by weight. If the amount of water for standard consistency of neat cement of any particular brand be less than 20 per cent. then the amount of water for standard consistency of 3 to 1 sand briquettes for this particular brand shall be one-half of the amount used in neat tests.

#### (7) PREPARATION OF BRIQUETTES.

##### (a) HAND-MADE.

(1) Neat Cement. The moulds shall be slightly oiled on the inner side and placed upon a metal or glass plate. The mixture of cement and water shall then be thoroughly worked together (preferably in a Faija's mixer) for five minutes. The moulds shall then be filled well above the rim, so that the mortar presents a convex surface. With an iron trowel the mixture shall then be patted, commencing at the side, first gently and then harder until it becomes elastic and water appears upon its surface. No after addition of the mixture shall be allowed, as the briquettes must be of uniform density throughout. The superfluous cement shall then be removed and the surface smoothed by means of a knife or sharp-edged trowel. The moulds can only be removed when the cement has hardened sufficiently. The briquettes shall then be placed in a damp chamber (zinc lined) furnished with a lid (also zinc lined) to prevent the irregular drying of the briquettes under varying degrees of temperature. After a period of 24 hours the briquettes shall be laid in water and kept completely submerged during the whole period of hardening. The proportion of water used shall be stated in the report.

(2) Sand and Cement. Five pieces of blotting paper soaked in water shall be laid upon a metal or glass plate, and upon each piece of paper there shall be placed a mould, also moistened with water. The cement and sand in their specified proportions shall then be thoroughly mixed together, after which the water shall be added, and the whole thoroughly worked for five minutes. With the mortar thus obtained each should be filled by one application so as to rise in a convex form above the edge of the mould. With an iron trowel the mortar shall then be patted, beginning from the side, first gently, then harder, until it becomes elastic and water appears upon the surface. No additional material must be added, as the briquettes must show a uniform density throughout. Superfluous mortar shall then be taken off by means of a knife or sharp-edged trowel, and the surface smoothed.

The moulds shall then be carefully removed and the briquettes laid in a damp chamber (zinc lined), furnished with a lid (also zinc lined) to prevent irregular drying. After a period of 24 hours the briquettes shall be laid in water and shall be kept completely submerged during the whole period of hardening.

##### (b) MACHINE-MADE.

(1) If possible, briquettes prepared as above shall be subjected to a uniform specified pressure (say, for example, 20 lbs. per square inch) by means of a ram of the same gauge as the moulds, or,

(2) A Bohme apparatus may be used. In this case, the moulds shall be filled with about 4-10ths of a lb. of mortar, prepared as in (a), and shall be placed in the machine; 150 strokes shall then be applied to the core with a hammer of about 4.4 lbs. in weight (2 kilog.). After removing the mould and the core the briquettes shall be smoothed off, taken off the subjacent plate and treated as in (a).

By care in following the instructions given in (a) and (b) it will be found that hand work and machine work will give fairly uniform results. Doubtful cases, however, should be invariably decided by machine-made briquettes.

#### (8) TESTING MACHINES.

Testing machines shall be of the positive lever automatic type, so arranged as to apply the loads quietly and uniformly at the rate of 200 lbs. per minute.

#### (9) CLIPS.

The style of clips shall be such as will break the briquette at the line of least section. Clips with adjustable rubber or paper composition rollers are found to work satisfactorily and should be used.

#### (10) CHEMICAL TESTS.

Chemical tests and full quantitative analyses are strongly recommended; and preference will be given to cements of which analyses are furnished by the manufacturers.

#### (11) ADULTERATIONS, ETC.

Any cement containing adulteration shall not be accepted as a Portland cement. There are also certain ingredients which should be strictly limited in their amount. If there is found to be more than 2 per cent of sulphuric acid or 3 per cent of magnesia, the cement should be rejected. It is understood that Portland cements only are being specified for. The silica or sand cements are in a class by themselves, need special specifications, and are not intended to be included in the present one.

#### (12) PACKING.

Cement shall either be packed in paper-lined, air-tight barrels, well constructed and hooped so that, under ordinary conditions of handling, no cement shall sift out, or if in sacks, the texture of the sacks shall be so strong and fine as not to permit of any sifting out or wasting of cement under ordinary conditions of handling. The net amount of cement, deducting the weight of the package, shall be 350 lbs. per barrel.

#### (13) CERTIFICATE.

The manufacturer shall give a written certificate with each shipment of cement, stating (1) the date of manufacture, (2) the tests and analyses which have been obtained at the manufacturer's laboratory for cement taken from the day's grinding of which this shipment forms a part, (3) that the cement does not contain any adulteration.

#### RECOMMENDATIONS.

Frost Test on Cement. In case of experimental tests made for the purpose of determining the action of cements when exposed to severe frost, it is recommended that the cements be mixed at a temperature below freezing, with cold water, cold sand, and kept exposed to ordinary winter weather, just as they would be exposed in actual construction of masonry. A description of what is done in this connection should be kept for comparison with other results, and the records of such experiments filed with the secretary of the Canadian Society of Civil Engineers.

It has been observed in hot bath tests that little pustules or eruptions take place on the surface; instances are also given of the glass shattering in the hot bath test without separating from the cement or without any other sign of failure on the part of the cement. Members of the society are requested to observe the causes or reasons therefor and report the same to the secretary of the society.

Inasmuch as small consumers are rarely able to gauge or mix their test specimens with a mechanical mixer, it is advised that where tests are made by hand mixing, due discrimination shall be made in comparing the results with tests made by mechanical mixing. Hand mixing done by an expert will probably agree closely with mechanical mixing, but for ordinary testing the mechanical method will give more uniform results, inasmuch as no skill or dexterity is required to produce approximate uniformity.

Cement testers, where possible, should make long time tests to see whether or not there is any connection between high early tests and future falling off in tensile strength, and whether, when mixed three to one with sand, the same or similar deterioration is observed. These tests should, if possible, be carried on for several years. It would be of the utmost value to the profession to obtain positive data on this point from engineers in charge of municipal university or other laboratories, who are in a position to supply it.

The sudden death is recorded of Mr. Thomas Mowbray, a well known, sculptor, of Toronto. Before coming to Canada the deceased executed carvings on some of the most important public buildings of Liverpool, Eng. The Toronto Custom House shows examples of his skill.

Mr. J. O. Marchand who for nine years past has been engaged in the study of Architecture at the Ecole des Beaux Arts in Paris, has returned to Montreal, his native city, and in conjunction with Mr. Stevens Haskell, of New York, has commenced the practice of his profession there. The firm have opened offices in the London and Lancashire Building, St. James Street.

## BY THE WAY.

The announcement that a manufacturing company has leased until August first next, the Machinery Hall on the Industrial Exhibition grounds at Toronto, as a storage warehouse, paying therefor a rental of \$300 per year and for extra insurance, suggests the enquiry: Why might not the other important exhibition buildings be thus utilized for ten months of every year and made to yield a revenue?

x x x

"It is especially easy for a plumber to lose his reputation for good workmanship," said a prominent member of the Guild. "After you have as you suppose put in the very best materials and workmanship, the system has perhaps no sooner gone into use, than lo! a leak develops, due to a flaw in the tap, and straightway the plumber's work is condemned and his reputation with that particular customer at least has suffered, and through no fault of his own."

x x x

The fall of the Campanile at Venice serves to confirm the old adage that declares: "It's an ill wind that blows nobody good!" The accident has created a general feeling of alarm regarding the safety of the other famous structures of the city. Investigation has apparently been started none too soon, for it is said that cracks and fissures have been discovered on every hand and the wonder is that the walls of some of the buildings have held together so long. During a recent service in the Church of St. John and St. Paul the capital of a small window column fell from its place and created a panic. The prospect before the builders of Venice is most encouraging.

x x x

In the Middle Ages many of the principal buildings, devoted to religious uses, were designed by monks. Interest in architecture by the clergy of the Roman church continues to the present, but as a rule the designing of their buildings is entrusted to architects in

regular practice. It appears, however, by an announcement in the press that the Rev. Father J. Bouillion, Canon of the Roman Catholic Cathedral at Ottawa, Ont., has prepared and had approved by a religious community in New York plans for a church edifice of colossal proportions, to be called the Nova Sancta Sophia. Accommodation has been provided for 60,000 or 70,000 persons. The structure is to be surmounted by a dome 420 feet above the ground, while the interior is to be enriched with columns of rare marbles and costly mosaics.

## PATENT STORE FRONTS.

One of the new inventions, covered by half-a-dozen patents in the U.S. and Canada is the Coulson Corner Posts and Transom Bars. This is of great importance to all architects and builders, and a large number have already been ordered for different points in Canada. The great feature of this invention is that plate glass can be put in from the outside. It has the advantages of least obstruction to light, greatest strength for holding large windows safely, and least danger and trouble in setting or replacing large plate glass.

Instead of a heavy wood frame, "The Coulson" is made of a narrow light piece of soft wood set into a groove, in the back of which the angle of a steel T-bar is sunk and firmly fastened by lag screws. The glass being set and firmly secured by wooden stops the advantage of an all-wood bearing for the heavy plates is secured with the rigidity of the iron T-bar added. The face of the posts and bars, together with the wood stops which make up the outside may be covered with polished brass, sheet aluminum, oxidized nickel plate or copper sheeting, firmly screwed to the wood after the glass is set, presenting a beautifully neat and light appearance of a single metal or wood strip between the several plates of the window.

For artistic windows, for economical and effective displays or advertising this new invention is especially useful and we predict a large sale throughout Canada.

The Metropolitan Plate Glass Insurance Co. of N. Y. made a thorough investigation of the Coulson and they have highly commended its use to all architects and builders. They also stated that the invention was the very best to lessen losses occasioned by handling plate glass.

A visit to the works of the Coulson Co. show a busy section of the city of Columbus, Ohio. They will be pleased to send their illustrated book to all applicants.

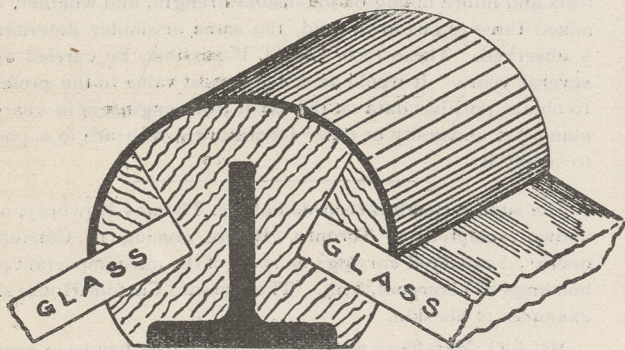
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### THE MERCHANTS' BANK OF CANADA, WINNIPEG.

The extraordinary progress made by this energetic western city prompted the Merchants' Bank to be in the very van of business, and with the fullest faith in the permanence of this progressive movement, decided to erect a substantial 8-storey fire-proof bank and office building, on a splendid site at the corner of Main and Lombard streets.

The designing of this important work was entrusted to Mr. Andrew T. Taylor, F.R.I.B.A., architect, of Montreal, who has designed many bank buildings throughout the Dominion. Most of the ground floor is occupied by the bank, and the other floors are all laid out as offices. The subsoil in Winnipeg is a somewhat soft clay, and as this is probably the heaviest building for its area that has been erected there, special precautions had to be taken with the foundations.

The ground storey is of fine cranelled creamy white Indiana limestone on a plinth of granite; above that the storeys are of a fine toned red pressed brick from St. Paul, with a great deal of stone dressings, and surmounted by a very elaborate and handsome ornamental copper cornice.

The banking room is handsomely finished in antique oak and marble, and has an ornate and rich elliptical arched ceiling. The floor is of ornamental mosaic, and the large windows afford magnificent light. The vaults are strongly and elaborately built, and nothing has been spared to make the building complete in every respect. Two electric elevators supplied by The Fensom Elevator Co. of Toronto, give rapid service to the offices. The elevator enclosures are of very handsome ornamental design, being of specially designed wrought metal and finished in antique brass.

The staircase is of iron and marble. The entrance is lined with rich marbles. The staircase goes up to the roof, and as this is the highest building in Winnipeg, a very extended view is obtained of the city and surrounding country. The offices are finely finished in hardwood, with plate glass windows and hardwood floors.

The general contractors were Messrs. Black & Co., of Winnipeg. The bank fittings were executed by the Canadian Office & School Furniture Co., of Preston, from designs by the architect. Mr. Frank Peters, of Winnipeg, and Mr. Robert Wilson, have very efficiently superintended the work.

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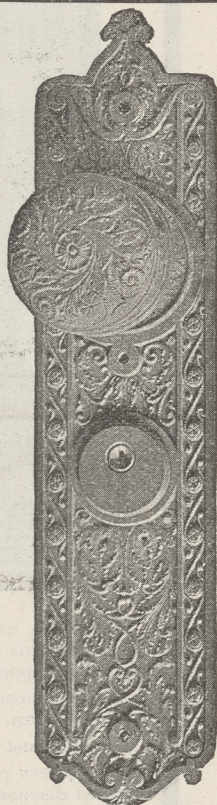
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A Russian nobleman is said to have built of paper a house of 16 rooms upon his estate at Savinowka, in Podolia. This house was made in New York, at a cost of 80,000 roubles, and its architect declares that it will outlast a stone building, which is quite creditable when one reflects upon the rapidity with which some of our stonework is disintegrating from the action of rain, frost and heat. Bergen, in Norway, has a church built of paper, capable of seating a thousand people.



Owing to its remarkable hardness, elasticity and durability, it rivals the best wax finish, but is free from its unpleasant slipperiness.

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### NOTES.

We mark the weather when its hot,  
We talk of cold and rain,  
Perhaps all this attention's what  
Has made the weather-vane.—Philadelphia Press.

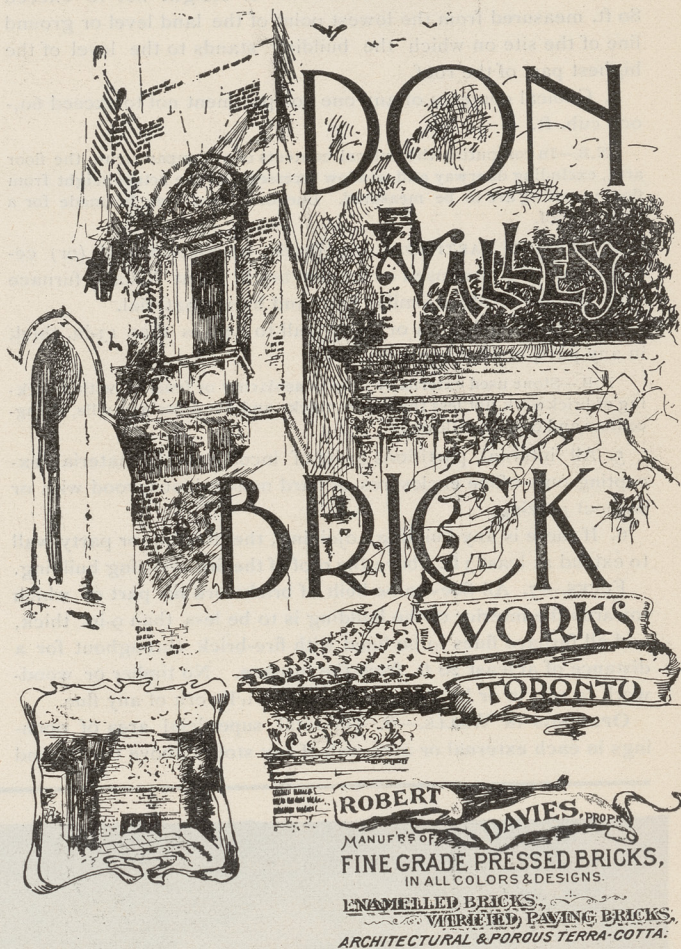
Messrs. Thos. Mowbray & Son, 284 King street east, Toronto, have designed and executed an oak tablet erected in memory of the late Rev. Dr. Scadding, first rector of Holy Trinity Church. It is in fourteenth century decorative Gothic style.

The demolition of the old Parliament Buildings on Front street west, Toronto, removes one of the oldest historical buildings of that city. The structure constituted the third Parliament house for Toronto and was occupied in 1832, being until 1841 the home of the Legislature of Upper Canada. In 1839 it was the court house, in 1846 King's College and Medical School, from 1853 to 1855 it was Toronto University, in 1848-9 an asylum for the insane, from 1849 to 1851 the Parliament House for the Province of Canada, from 1861 to 1867 military barracks, and from 1867 to 1892 it was occupied by the Legislature of the Province of Ontario.

Regarding the heating methods in vogue in Great Britain, the Contract Journal remarks :—Nowhere, perhaps is the unscientific and wasteful method of heating buildings by means of open grates so general as in this country, and as for ventilating, our only consolation is the knowledge that unscientific methods are more universal. As regards the heating problem, improvement on the now prevailing method is the inevitable outcome of dearer fuel, and it will find a ready solution when economy in fuel consumption becomes an absolute necessity. Until then the conservative and sentimental spirit with which we, individually and as a nation, seem to be unduly imbued, will, no doubt, maintain in vogue a system which involves imparting a maximum amount of heat to exterior walls and chimneys to no useful purpose, and a minimum of heat in the direction required.

The Wadleigh High School, N. Y. City, about completed, has some 800 "Frink" cluster reflectors which are the standard type of the N. Y. Board of Education. The additional fixtures in this building consisting of ceiling coronas with bent glass doors, and arch reflectors were all furnished by this firm. Their catalogue fully illustrates and describes their fixtures and is intended

to reach every architect who has occasion to specify lighting fixtures for stores, churches or public buildings.



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## BRITISH STANDARD FIRE RESISTING RULES.

The British Fire Offices Committee, which represents the whole of the Tariff Fire Insurance Offices, have issued the following rules for standard fire-resisting buildings:—

**HEIGHT AND CUBICAL CONTENTS.**—1. Height not to exceed 80 ft. measured from the lowest point of the land level or ground line of the site on which the building stands to the level of the highest part of the roof.

2. Cubical contents of any one compartment not to exceed 60,000 cub. ft.

N.B.—In computing the cubical contents of a compartment, the floor area, excluding doorway and window recesses, and the actual height from floor to ceiling are to be measured. Due deduction may be made for a sloping roof.

**WALLS AND PARTITIONS.**—3. Brick, terra-cotta and (or) cement-concrete composed of broken brick, burnt ballast, furnace slag, clinker or other similar hard and burnt material.

4. No external area or party-wall to be less than 13-in. thick in any part, or if of concrete 20-in.

N.B.—Stone used externally only as ashlar or fencing, with a backing of brickwork not less than 13-in. thick, and for dressings, sills, string-courses and cornices allowed.

5. All internal partitions to be of incombustible material, excepting only office enclosures of hard non-resinous wood with or without glazing.

6. If there is any building adjoining, the dividing or party-wall to extend at least 3 ft. above the roof of the fire-resisting building.

**FLUES.**—7. All flues to be built of brickwork no part of which towards the interior of the building is to be less than 9-in. thick, and all furnace flues to be lined with fire-brick throughout for a distance of at least 20 ft. from the furnace. No timber or wood-work to rest in or be plugged into the brickwork of any flue.

**OPENINGS IN WALLS.**—8. The total superficial area of openings in each external or area wall of any storey above the ground

storey not to exceed one-half of the area of the wall (measured as to height from floor to ceiling of the storey in which the openings occur). All loop-hole or teagle doors and frames and window-frames and sashes to be of iron or other hard metal. All windows above the ground storey to be glazed with glass not less than ¼-in. thick in sections not larger than 2 ft. super., or wired glass not exceeding 1-in. mesh in sections not larger than 4-ft. super.

9. Every window or other opening above the ground storey opposing (whether directly or diagonally) and within 20-ft. of any window, skylight or glazed or other opening in any other building (whether such latter window, skylight or opening be protected or not), or overlooking (whether directly or diagonally) and within 20-ft. of the roof of any building, to be protected by "fire-proof" shutters or "fireproof" doors.

**FLOORS.**—10. Brick arches, terra-cotta, fire-clay or concrete as above described, the floor being in no part less than 6-in. in thickness, and carried on metal joists, girders and columns, or brick walls or piers.

N.B.—Floors of wood not less than 9-in. thick ceiled with plaster on metal lathing and with the floor boards laid on the bearers without intervening space allowed.

11. Wooden flooring laid on concrete allowed provided there is no space between the wood and the concrete. Wooden fillets not exceeding 2 in. deep permitted if bedded flush in the concrete.

12. Scuppers to carry off water, the opening of each of which shall not be less in area than 21 in. super., to be provided in the external walls to each floor above the ground storey at intervals of not more than 12 ft.

N.B.—In buildings within the city of London or within the area controlled by the London County Council scuppers are not essential.

**ROOFS.**—13. Roofs to be entirely of the incombustible materials as described for floors in Rule 10, except that 4-in. be substituted for 6-in. in thickness.



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Outlets on to roofs rendered necessary to satisfy the requirement of the Factories and Workshops Acts permitted, provided that all doors and frames be of iron or cased in iron plate at least  $\frac{1}{8}$  in. thick, and that they be self-closing.

PROTECTION OF STRUCTURAL METALWORK.—14. All columns or stanchions to be covered with brickwork or porous terra-cotta (at least 2 in. thick), or with cement, concrete or plaster at least  $1\frac{1}{2}$  in. thick, keyed into metal supports and protected by a metal guard up to a height of not less than 4 ft. from the floor where cement, concrete or plaster only used.

15. Girders, joists, lintels and all structural metalwork (other than columns and stanchions, but including framework of roofs), where not covered with brickwork, to be completely encased in porous terra-cotta at least 2 in. thick, securely anchored, or cement, concrete or plaster at least 1 in. thick keyed into metal supports.

16. Space must be left at the ends of girders and joists to permit of expansion.

LININGS AND CEILINGS.—17. No lining of wood or textile fabric to any part of the walls, partitions, ceilings or roof.

FLOOR OPENINGS.—18. No openings through any floors allowed except as follows:

(a) Holes to admit driving shafts, pipes and iron or earthenware tubes for electric conductors. Shafts to fit closely in metal collars, and all pipes and tubes to be cemented round the full thickness of the floor.

(b) Staircases and hoists of which the enclosures are constructed entirely of brick or cement concrete as above described at least 9-in. thick, with a regulation fireproof door to every opening.

N.B.1.—Stairs and landings within said enclosures to be constructed of incombustible material.

N.B.2.—Where the building is within the city of London or in the area controlled by the London County Council, hardwood doors to openings may be allowed instead of fireproof doors.

N.B.3.—Where the staircases and hoists extend to the top floors they must have a glass roof protected externally with strong wirework, and the enclosing walls must be carried through and 18 in. above the roof of the building.

In factories and workshops in the area controlled by the London County Council a glass roof protected as above is only to be provided in cases where the enclosing walls and staircases are carried through and 18 in. above the roof of the building, and also above the roof of the adjoining premises. Otherwise the roof must comply with the requirements of the London County Council.

(c) Belting and rope races enclosed as for staircases and hoists.

SHAFTING THROUGH WALLS.—19. Shafting where passing through walls to fit closely into wall, or have wall-boxes closed with iron plates not less than  $\frac{1}{4}$  in. thick, leaving no open space.

PIPES AND ELECTRIC CONDUCTORS.—20. All pipes in the building, except water pipes not exceeding  $1\frac{1}{2}$  in. in diameter, to be of hard metal. No wooden casing to be used for enclosing electric conductors.

COMMUNICATING COMPARTMENTS.—21. Two or more compartments, each constructed in accordance with these rules, may communicate, whether by double fireproof doors or otherwise provided that their aggregate cubical contents do not exceed 60,000 cub. ft.

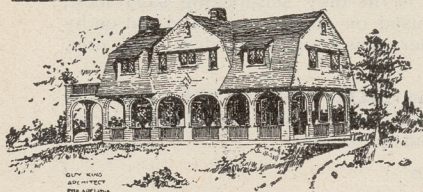
22. Two or more such compartments whose aggregate cubical contents exceed 60,000 cub. ft. can only be allowed to communicate across a fire-proof compartment built up from the basement with walls of solid brickwork, and constructed in all other respects in accordance with these rules so far as the same are applicable and having all openings protected by fire-proof doors at least 6 ft. apart.

23. Except as above, no communication allowed between a compartment constructed in accordance with these rules and any other building or compartment.

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own minds as to the meaning of the clause in question, but the proprietors suddenly interposed with a claim to decide for themselves as to the disposal of all provisional sums, refusing to recognize all instructions given by the architect. Legal opinion was taken on both sides, and it then appeared that the clause relied upon did not legally confer any power upon the architect unless with the previous consent of the proprietors. Matters then became somewhat unpleasant, and an interesting series of lawsuits at one time appeared to be imminent, but ultimately all differences were amicably adjusted. The example to which we have referred clearly indicates the desirability of looking with caution upon forms of expression whose actual value has not been ascertained with certainty.

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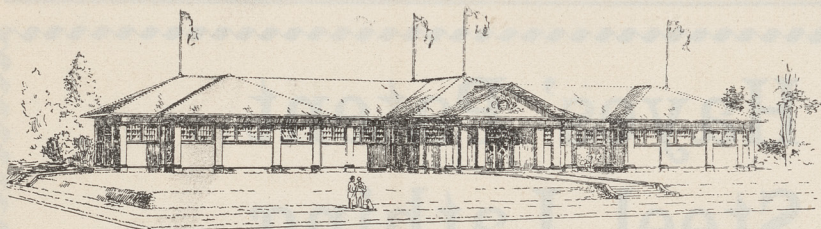
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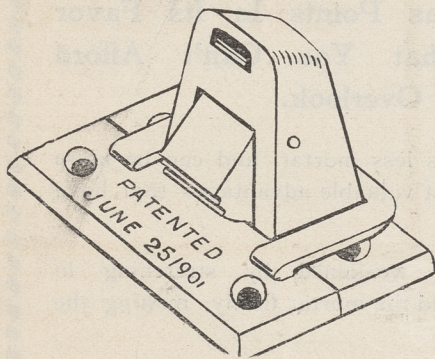
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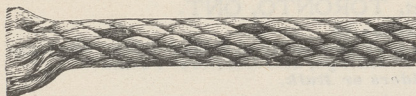
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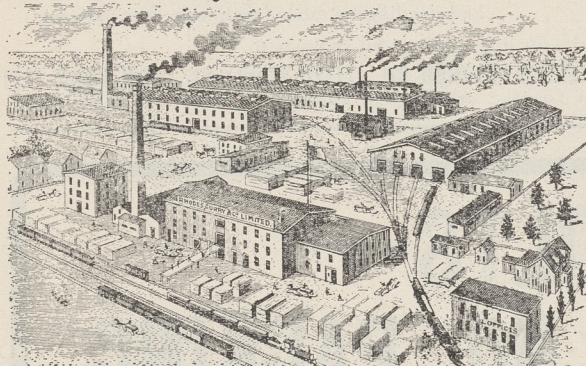
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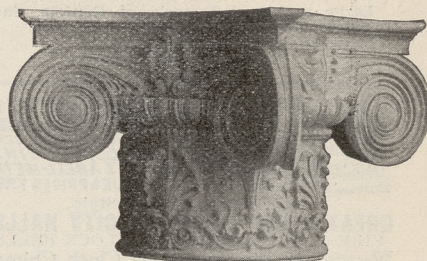
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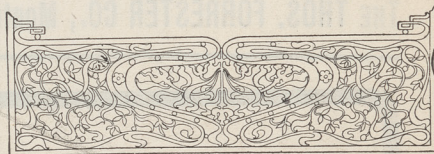
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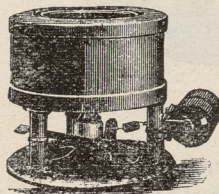
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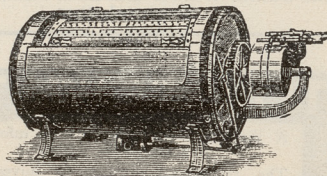


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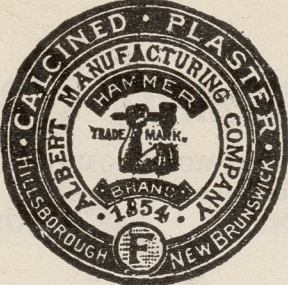
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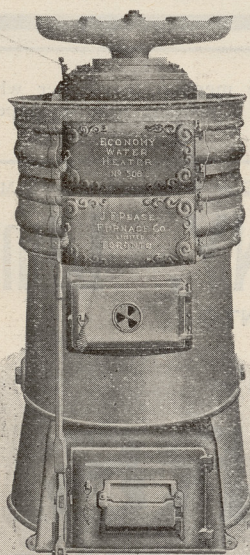
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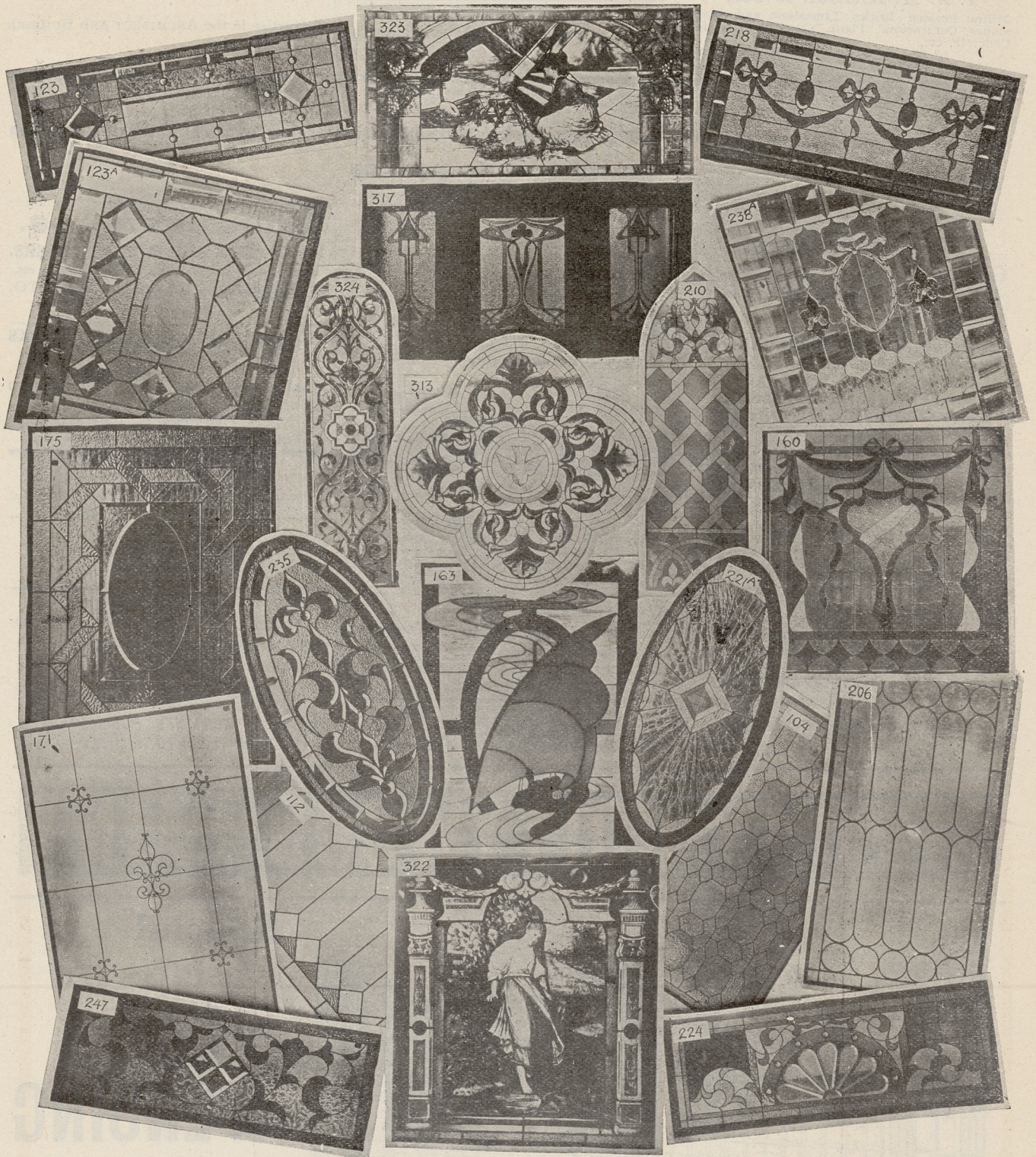
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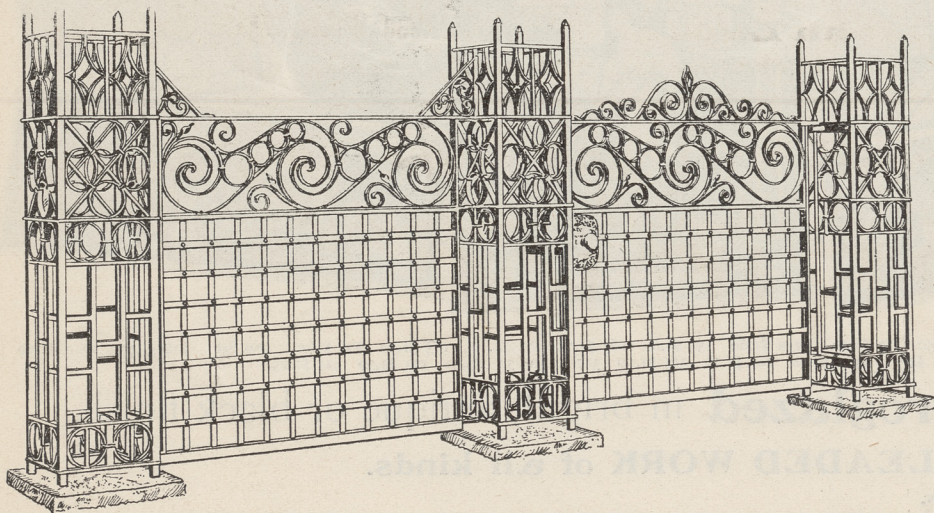
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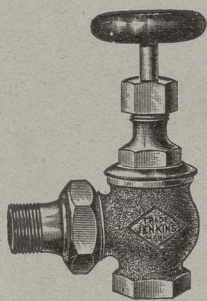
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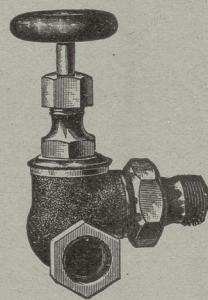
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